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ABSTRACT

This manual is designed to provide an alternative for small colleges that are unable to use computer-based software and models available through the National Center for Higher Education Management Systems (NCHEMS). Included are concepts drawn from other NCHEMS costing projects, using simplified worksheets for cost-analysis computations rather than computer-based systems. Guidelines are presented for developing unit-cost data for use in internal management, and producing nonfinancial data that are useful in interpreting cost information. The guide is based on current practice among a group of small colleges that developed their own costing methods. These practices can be compared across units or with other campuses. Appendices include: descriptions of costing approaches and the use of cost information from "Procedures for Determining Historical Full Costs;" a discussion of cost and costing principles in higher education from "Fundamental Consideration for Determining Cost Information in Higher Education;" a student data module software description; and information on constructing an instructional workload matrix. (SW)

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AN APPROACH TO COST STUDIES IN SMALL COLLEGES

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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An Approach to Cost Studies In Small Colleges

Gary Gamso

1978

NATIONAL CENTER FOR HIGHER EDUCATION MANAGEMENT SYSTEMS
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Preface

Many cost-analysis and cost-projection techniques produced by the National Center for Higher Education Management Systems (NCHEMS) for use on college and university campuses have depended heavily on computer-based systems. These systems supply the required input data, process or manipulate those data, and produce computer-generated reports on the results. This reliance on computer-based systems in support of NCHEMS products is recognition that a growing number of institutions in the country have access to computer systems. The exception to this general trend is the small college that either has no on-site computer facilities or has a system too small to benefit from NCHEMS software developments.

Small colleges, the sector of educational institutions most heavily impacted by today's financial exigency, require costing techniques and methodologies similar to those available through the Center, but less reliant on computer-based data or systems. This document provides a small-college administrator who has some familiarity with campus financial records with a simplified approach to instructional and related cost analysis. The manual includes concepts drawn from other NCHEMS costing projects, using simplified worksheets for cost-analysis computations rather than computer-based systems. The concepts are those related to cost analysis—the study of historical costs to monitor trends or to identify inordinately high or low expenditure patterns.

An Approach to Cost Studies in Small Colleges provides a set of guidelines for developing unit-cost data in academic disciplines (such as average cost per credit hour) and in student majors (such as the average cost per student); gathering noninstructional, comparative-cost data for use in internal management or for exchange among a group of institutions; and producing nonfinancial data that are useful in interpreting cost information. The document contains material for use by academic decision-makers to help understand the economics of institutional operations, including instruction. For the person on campus who serves as cost analyst, there are also detailed procedures for deriving all the cost data. These cost-study procedures aid in the collection of information that can provide a new perspective to campus planning and analysis. The information is not intended to replace as much as to complement what is now collected.

The success of a campus in using the guide depends on the availability of a cost analyst and the presence of an organizational climate that promotes the availability and use of cost analysis among the various levels of campus decisionmakers. There is always a risk that information such as that gathered in this guide will not be useful to individuals or committees responsible for planning and evaluation. Therefore, the reader of this document should review the costing concepts with the following questions in mind:

- Will these concepts produce information useful to campus decisionmakers?
- Are the necessary resources available (people, time) to produce the information?

This document does not represent an NCHEMS research and development effort in which the objective would be to produce an ideal approach to deriving cost-analysis information. Instead, it is a synthesis of current practice among a group of small colleges that, for the past few years, have worked with Center staff in developing their own costing methods. Some of these colleges are still using the techniques, others are not. In some respects, then, this manual is a case study of the various approaches developed by the colleges; without their interest and effort, it would not exist. Throughout the material that follows, the colleges that participated are referred to as *pilot campuses*, since one or more of them have tested each of the concepts and procedures outlined. Individuals who served as cost analysts on the pilot campuses included vice-presidents for finance, institutional researchers, controllers, associate academic deans, assistants to the president, and faculty.

The objective of the pilot campuses in this work was to gather information for comparisons across campus units or with other campuses through exchange of data. In all cases, the pilot campuses began with an existing document, *Procedures for Determining Historical Full Costs* (Hughes and Topping 1977), and modified it to suit their needs. In most cases, the campuses changed definitions and procedural steps to reduce or eliminate the need for a computer system. The procedures in this case-study document provide for the manual computation of cost data. As will be explained later, computer support is necessary only for processing student-registration data to develop an Instructional Work Load Matrix (IWLM), which in turn permits the computation of annual cost per student major.

In addition to generalizing many of the ideas of small-college cost analysts, this document describes concepts that are important to understanding cost information and its application. Recent work has been done by the National Association of College and University Business Officers (NACUBO) to explain theoretical concepts that serve as a foundation for determining and using cost information. Selections of that material are included in the text and appendixes of this document. Other work involving cost studies in private colleges has been conducted by the Council for the Advancement of Small Colleges (CASC). This work is described in a CASC publication, *Instructional Program Analysis: A Users Manual* (Shoemaker 1978). Results of research by George Beatty, Warren Gulko, and Bernard Sheehan to identify the major determinants of unit costs also have been used in these procedures and were tested on some of the pilot campuses. Finally, ideas and suggestions are incorporated in this material from a recent publication, *Colleges and Money: A Faculty Guide to Academic Economics* (*Change* 1976), that may aid faculty and academic administrators in understanding the fiscal circumstances of their institutions and help discredit some prevailing folklore.

The pilot campuses and individuals involved in this effort are listed below. For their support, thoughtful suggestions, and contributed time, the Center is grateful.

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For all opinions, suggestions, and policy statements in this document, the author alone is responsible. Neither NACUBO nor the colleges mentioned has endorsed this cost-study guide.

CHAPTER 1

Introduction

Cost analysis and awareness of the need to control costs in higher education date back to the early 1900s. An early method for computing educational unit costs was developed by Cooke, in an attempt to account for differences in the scale of campus operations (Adams, Hankins, and Schroeder 1978, p. 95). The past 70 years have witnessed the refinement and standardization of financial reporting and analysis techniques. In recent years, the development of standards for accounting practice by such organizations as the National Association of College and University Business Officers (NACUBO) and increased reliance on automated accounting systems have led to more accurate and readily available cost information.

Since its inception in 1969, the National Center for Higher Education Management Systems (NCHEMS) has been active in the development of techniques and models to aid in the study of institutional costs. A recent NCHEMS-NACUBO document, *Procedures for Determining Historical Full Costs* (Hughes and Topping 1977), provides guidelines for developing historical cost information and for applying the information to institutional decisionmaking. This cost-study document relies heavily on computer-based software to aid in the analysis, as does much recent work in the area of costing (Haight 1975a).

An Approach to Cost Studies in Small Colleges is intended to provide an alternative for the small college that is unable to use computer-based

software and models available through NCHEMS. It incorporates many of the concepts included in the NCHEMS-NACUBO procedures but uses manual worksheets, rather than an NCHEMS computer-based system, for data computations and manipulations. A side benefit of the manual approach is that campus administrators will gain greater understanding of the analytical assumptions and statistical distributions that are part of a unit-cost estimate. With actual involvement in the use of the costing procedures, executive-level staff will be able to suggest modifications that are appropriate to the institution's own context and its particular need for cost-analysis information.

Detailed costing procedures are given in chapter 2, to aid in manual computations by a cost analyst or to assist a data-processing group in developing an automated system for using this method. Only one part of the process—tabulation of student-registration data for the computation of annual cost per student—actually may *require* the use of a computer system.

Appendix A includes introductory material from *Procedures for Determining Historical Full Costs* that describes various costing approaches, the use of cost information, and limitations on use of the costing procedures for interinstitutional comparisons. Appendix B, "Fundamental Considerations for Determining Cost Information in Higher Education," is reprinted from a NACUBO publication. It provides a complete discussion of costs and costing principles in higher education.

The Need for Cost Analysis Information

Financial exigency is a problem of particular importance to small colleges, whose smaller budgets allow less discretion in the solution of operational problems. Under such circumstances, cost information serves at least two purposes. First, annual attention to cost analysis and supporting information provides an early warning of financial trends, which may help in recognizing an impending crisis. Second, the information will assist in proposing alternatives for dealing with financial exigency.

Collard, Farmer, and Harrison (1977) suggest:

> Direct program and discipline costs [can be] examined to identify low utilization of facilities and faculty, the enrollment data [can be] used to identify low or decreasing program of course enrollments, and the general financial and analysis models [can be] used to compare administrative and other support costs between institutions. All these data are used to identify areas for more specific investigation and, in conjunction with careful judgment, to suggest corrective actions. [P. 35]

In the same book, David Leslie of the Center for the Study of Higher Education as the University of Virginia says that

> exigency will require important changes in the process of education. Finding less expensive and more effective ways of accomplishing the university's business will require a close look at the whole "production" process. While economies of institutional operation can be effected in a variety of ways, mostly by trimming overhead, the most promising long-term approach lies in increased productivity. . . . The turning of the economic screw is going to hurt people as well as programs, and the compassion with which they are handled will tell a great deal about where we are headed as a community. [P. 13]

Solving such problems is accomplished both through the notion of an "informed environment," in which information is an aid to understanding the complexities of the education process, and through participatory management, in which academic administrators understand the intricacies of the management and budgeting process. The notion of participation ensures that decisions are made on the basis of institutional mission and priority as well as financial considerations.

Distinctions between Financial Accounting and Cost Analysis

All campuses maintain financial-accounting records, information used to meet fiduciary responsibilities and to report to trustees, students, alumni, external funding agencies, and internal managers. Monthly, quarterly, and annual accounting reports generally satisfy the need for financial information that describes the accounting and business operations conducted by the institution on a day-to-day basis. Every campus has an *accounting system* containing accounts or budgets developed along the lines of organizational units (academic departments) or aggregations of units (academic divisions or colleges). This system places financial responsibility in the hands of unit administrators. *College and University Business Administration* (NACUBO 1974) provides a comprehensive set of standards for *financial accounting* among colleges and universities.

Some aspects of institutional management call for the use of cost information that goes beyond ordinary financial-accounting data. It may be necessary to perform a *cost analysis*, described as "any manipulation of cost [accounting] data done to provide relevant information for those who make decisions" (Adams, Hankins, and Schroeder 1978, p. 21). Cost analysis starts with financial-accounting data and produces information that will help to understand patterns of resource use or to evaluate

the past performance of units. The results of such analysis may help to identify expenditure trends or relative differences in costs among units.

An administrator may want to know, for example, how much money was spent for instruction on campus during the previous year. Year-end data will show the amount expended by each instructional department for personnel, supplies, services, equipment, and other expenditure objects. Cost analysis will use this information and additional data (such as faculty work loads) to provide estimates of instructional costs in the following additional ways:

- The *average* cost to teach a credit hour in each academic department
- Total cost and average cost of instruction *at different levels* within each department
- Costs within *activity categories,* such as instruction, departmental administration, community or public service, and student support

Cost analysis and financial accounting both use expenses incurred during a specified period as their prime factor. But cost analysis incorporates additional data to provide a fuller picture of costs. Financial-accounting data alone cannot always portray the cost of services actually provided. A faculty member housed in one department on a small campus, for example, frequently teaches courses in other departments as well, and also may have administrative assignments. Accounting records typically show the faculty member's salary as paid by the primary department. Cost analysis, on the other hand, would apportion the salary among the departments where the work is actually done. Cost-analysis methods also can be used to divide the salary among instructional and noninstructional activities within the department, on the basis of information about the faculty member's actual assignment.

Financial-accounting systems are not designed to document the circumstances just described. To alter them for that purpose would entail unnecessary administrative expense in the day-to-day financial operations of the campus. Since this kind of information is required only occasionally, it is better to think of cost analysis in conjunction with financial accounting and only when such analysis is needed.

While cost-analysis methods will provide information not otherwise available from accounting records, a few important caveats must be mentioned. First, the analysis of cost and supporting data can be expensive, depending on the amount of detail required, the extent to which accounting records reflect this detail, and the frequency of the analysis. Second, the results of cost analysis are only *estimates* of cost and their use requires an understanding of the manipulations performed. Third, cost-analysis data

identify *relative differences* in operating one department as compared to another. Additional work is required to determine why such differences occur, whether they can or should be changed, and what the impact of any changes will be. Finally, there is no single method of cost analysis in postsecondary institutions. The definitions of costs to include in the analysis and, to some extent, the type of manipulations performed should be determined by the institution's ultimate use or purpose.

"Although cost analysis can consider past and present actions alone, one of its major uses is that of providing cost information concerning alternative opportunities available and assisting in the selection of those (future) alternatives considered appropriate" (NACUBO 1975, p. 11). The NCHEMS and NACUBO documents mentioned earlier describe the procedures to be used in the accounting or analysis of financial data, but they do not offer suggestions on how to control or influence costs. It is the position of both organizations that they can assist in the collection and interpretation of cost data, but that decisions about what should be done to change costs are the responsibility of campus executives who understand all the contextual circumstances surrounding those decisions.

DEFINITIONS

This document provides a set of procedures for the computation of *historical direct costs*. The term *historical* implies that the cost analysis is performed on past records of financial expenditures. *Direct costs* are those readily assignable to a specific organizational unit (or activity area) as part of the operation of that unit. Activity areas are the various functions that occur within an organizational unit, such as instruction, research, or departmental administration.

Costs are derived for both academic *disciplines* and student majors (referred to as *student programs*). Noninstructional costs are mapped into *institutional programs*, which are usually aligned with institutional objectives—student services, fiscal operations, and so forth. This mapping is helpful where interinstitutional comparisons are considered important or analysis is done along programmatic rather than organizational lines.

The procedures include the computation of *unit costs*. In this document, *unit cost* refers to the average cost per unit of service (such as student credit hour) produced in instructional areas. It is generally derived to account for differences in the scale of operations as cost comparisons are made. Unit (or average) cost is derived by dividing total direct cost in an area by the total student credit hours (or other units) produced. Unit-cost data are useful in comparisons of past operating patterns. But

because of the fixed, variable, and semi-variable nature of direct costs (see appendix B), they are not an accurate predictor of future costs at different volume levels. Unit costing also should not be confused with the notion of marginal or incremental costing, which examines the cost associated with a specific change (increase or decrease) in a cost objective. Student credit hours are used as the divisor for unit costing in this document, to be consistent with other unit-cost methodology developed by NCHEMS, such as the *Information Exchange Procedures* (Gamso and Service 1976). Some campuses use the student contact hour, clock hour, or individual class as the unit of comparison. These procedures can be modified by simply substituting the preferred unit for student credit hour.

Throughout this document, the terms *department* and *discipline* refer to an academic area for which direct cost is determined. Department generally is used to refer to an organizational or budgetary unit. Discipline, on the other hand, refers to a unique academic or curricular area of study. The biology department, for example, may offer courses in biology, zoology, botany, and other such disciplines. Confusion may arise when the same term (such as biology) is used to describe both a department and a discipline. When a campus begins a cost-analysis effort, it must decide which of the two units is the focus of the analysis. *Course level* is another term used in the cost-analysis procedures, representing a further subdivision of departments or disciplines into lower-division, upper-division, and graduate-division courses.

Student program and *student major* refer to the classification of students into their areas of study. The notion of *student level* is similar to that of course level, except that it represents a subdivision of student majors, such as undergraduate students, instead of a subdivision of departmental offerings.

Interpretation of Cost Data

Since cost analysis is based on approximations, Sheehan and Gulko (1976) refer to instructional unit costs as an index of relative cost:

> For analytical purposes, instructional [unit] costs may therefore by regarded as indicators which have meaning only in comparison with similar numerical values. In this context, the development of a standard instructional cost index would be helpful for comparing diverse or remote academic operations. Moreover, such comparisons are meaningful only if the reasons for differences among values can be identified. [P. 59]

When unit-cost data are thought of as indicators, comparisons will naturally lead to the consideration of the relative differences among units. If the costing procedures have been applied uniformly, the relative differences will be meaningful. When these differences have been identified, it is important to have related nonfinancial data at hand to permit their interpretation. The procedures outlined in this document include the use of such data to derive parameters that are helpful in understanding differences between units. The parameters include average section size, faculty work loads, salary rates, and other information specified in an excellent explanation of the elementary principles of cost analysis by Sheehan and Gulko (1976). The section on interpretation and use of cost data in the next chapter further explains these concepts.

CHAPTER 2

Cost-Study Procedures

This chapter is a synthesis of approaches used by a group of pilot colleges that have worked with the Center's staff in the past few years to develop cost-study procedures. Each college or group of colleges developed variations on the *Procedures for Determining Historical Full Costs,* primarily to minimize dependence on computer systems. The concepts contained in those procedures also are included here, but the methodology needed to compute historical full cost[1] is not. In addition, the present document includes parameters, such as average section size, faculty work load, and faculty salary, that are considered useful in the interpretation of instructional-cost data.

Since the colleges involved in the cost study either were not interested in exchanging data or were interested in exchanging only among themselves, there was also some variance from the definitions suggested for exchange in *Procedures for Determining Historical Full Costs.* To simplify computations, for example, the course and student levels at which unit costs were computed were limited to two—undergraduate and graduate—rather than the numerous levels specified for data exchange. When extreme cost differences occurred in departments or student majors, the schools still had the option of performing the more detailed analysis.

1. Historical full cost is an estimate of the full or total cost of operating an academic department. It includes the departmental direct cost and an indirect cost that is a prorated share of the institution's support activities (such as operation of the physical plant).

The procedural steps used by the colleges are outlined in table 1. They represent a generalized set of cost-study procedures from those used by the pilot colleges. The remainder of this document further describes these procedures and provides worksheets for computations where necessary. To use the procedures, a small college initially might follow the steps verbatim, with the possible exception of variations in definitions. Thus the first attempt at a cost study will serve as a learning exercise to aid in understanding the methodology and identifying problems in campus data. Subsequent uses of the procedures should include modifications to improve the methodology or to accommodate errors in the data.

TABLE 1

SIMPLIFIED COST-STUDY PROCEDURES

Step 1: Definitions and cost centers
Step 2: The instructional work load matrix
Step 3: Departmental-cost analysis for instruction
Step 4: Instructional-program costing
Step 5: Analysis of noninstructional costs
Step 6: Interpretation of results

The cost-study steps are an intentional departure from the *Procedures for Determining Historical Full Costs.* They include all the costing concepts (with the exception of full-cost calculations), but they are developed in a modular form to allow the college to select only those portions of the cost study that it actually wants to perform.

The procedural steps that follow are discussed in the sequence in which they should be performed, since decisions made in the first step will influence the work done later. The six steps should be reviewed in their entirety prior to beginning work on the cost study, so that the user may (1) understand the decisions necessary in earlier steps and the impact they have on the results, (2) estimate the time required to complete the analysis, and (3) decide what portions of the cost analysis may be unnecessary.

STEP 1: DEFINITIONS AND COST CENTERS

This step has less to do with methodology that with definitions and terminology. It is up to the school performing the cost analysis to determine the units or subunits (for example, disciplines and course levels) that are the focus of the cost study. Since costs are attributed to these units and

subunits, they are referred to as *cost centers.* For a small college, a possible starting point is with *instructional departments* such as English, history, or foreign languages. Occasionally, there is interest in more detailed *discipline* costs where some departments, such as foreign languages, may be further subdivided into disciplines such as French, Greek, Spanish, and so forth. As the cost-study procedures are reviewed, it will become apparent that more detailed breakdowns require more computations and will add to the time needed to complete the cost study. The determination of cost centers to be used depends to a large extent on the purpose of the cost analysis; therefore, that decision is left to the college. Direct costs will be estimated for each cost-study *dimension.* The following discussion outlines the *dimensions* of cost analysis as described here and suggests initial definitions.[2]

Instructional Units: On many campuses, this is an organizational unit such as an academic department. Direct costs are estimated for each instructional unit. To have validity, these direct costs should be reconciled with some financial or budgetary data for the same unit. The recommended breakdown for instructional units is the academic discipline.

Course Levels: Costs are further subdivided within an instructional unit to the various levels of course offerings. Direct unit costs are estimated at this level. Undergraduate and graduate were the course levels used by all of the pilot schools in their initial cost-analysis work.

Student Majors: This and the student-level dimension are necessary only for the computation of direct and unit costs within student majors (step 4). This is commonly referred to as program cost. The student-major dimension is defined by the tables and codes used in the student-records office of the campus. A common list of student majors and codes is necessary only in the case of interinstitutional exchange of data. In such cases, recommendations included in the *Procedures for Determining Historical Full Costs* are a helpful starting point.

Student Levels: This provides a further subdivision of costs within student major. The number of student and course levels has a large impact on the number of computations to be performed in the cost study. A recommended starting point with this dimension is undergraduate and graduate, as suggested also for course levels.

2. These suggestions are based on the definitions used by pilot schools.

In addition to the *dimensions* of a cost study, a time frame must be chosen—that is, the period of time that will be covered by the cost analysis. Usually, this time frame is a fiscal year. If the summer session is a separately budgeted activity, it might be convenient to perform the cost analysis for the academic year separately from that for the summer session, to simplify the reconciliation of results with financial records. Data on student course work, faculty work loads, and financial expenditures are collected for the period of analysis.

STEP 2: THE INSTRUCTIONAL WORK LOAD MATRIX

The NCHEMS Instructional Work Load Matrix (IWLM) is a two-dimensional table that documents the total credit hours taught to all students in each major by the academic departments. Student-registration data from a previous term or year usually form the base for this procedure. The matrix uses the cost centers defined in the first step, including academic disciplines (instructional units), student majors, and course levels and student levels. The total student credit hours[3] generated by each discipline are used to calculate departmental unit costs (step 3). If it is desired to calculate unit costs for student programs as well as for departments, the IWLM provides a means to prorate departmental direct costs among student major areas (step 4). A complete IWLM, then, is required only for student-program costing. When an analysis of departmental costs is all that is needed, step 2 can be modified to reflect only the total student credit hours produced by each department and not the distribution of credit hours among student majors.

Figure 1 illustrates an IWLM similar to that developed by the pilot colleges. Rows in the table represent academic departments and their undergraduate and graduate courses; each column represents a student major and student level on the campus. The shaded row provides a breakdown of all the undergraduate student credit hours taught in the business department for the period of analysis, showing the total number of student credit hours taught to students in each major and student level. The shaded column illustrates the pattern of credit hours taken by all undergraduate students enrolled as history majors. Numbers appearing at each row/column intersection or matrix cell represent the total student credit

3. Student credit hours is used here to describe the total credit hours taken by all students enrolled in courses in the department. The computation of student credit hours produced by a single course is the product of the number of students enrolled in the course and the credit hours attributed to the course (called course credit hours). When the student credit hours are accumulated for all courses throughout the year, the result is total student credit hours for the department.

FIGURE 1

INSTRUCTIONAL WORK LOAD MATRIX

DEPARTMENTS	Course Levels \ Student Levels	STUDENT MAJORS: HISTORY — Undergrad Students	HISTORY — Graduate Students	POLITICAL SCIENCE — Undergrad Students	POLITICAL SCIENCE — Graduate Students	SOCIOLOGY — Undergrad Students	SOCIOLOGY — Grad Students	PSYCHOLOGY — Undergrad Students	PSYCHOLOGY — Grad Students	"OTHER" MAJORS — Undergrad Students	"OTHER" MAJORS — Grad Students	TOTAL
BUSINESS	Undergraduate Courses	60		90		120	15	150	45	3000		3480
	Graduate Courses				15						450	465
ELEMENTARY EDUCATION	Undergraduate Courses			45		120		150		1800		2115
	Graduate Courses											
SOCIOLOGY	Undergraduate Courses	150		90	15	320		150		3400		4125
	Graduate Courses						90				450	540
PHYSICAL EDUCATION	Undergraduate Courses	20		30		40		50		1200		1340
	Graduate Courses										288	288
"OTHER" DEPARTMENTS	Undergraduate Courses	70		195	15		15	250		8600		9145
	Graduate Courses		120		75				315		612	1122
	TOTAL	300	120	450	120	600	120	750	360	18000	1800	22,620

hours taught by that department and course level (row) to all the students enrolled in that major and student level (column) over the period of analysis (for example, an academic year). The matrix shows, for example, that 60 student credit hours were taught through business undergraduate courses to students enrolled as history undergraduate majors.

Many campuses find the IWLM data useful in their own right. The matrix provides an accurate set of historical data documenting each department's contribution (in terms of credit hours) to the various majors in which students enroll. Monitoring this contribution over a series of years can be helpful in understanding the impact that changes in enrollment among majors can have on academic departments. The matrix documents the course-taking patterns of students by showing the discipline areas in which electives are taken.

The total for a row of the IWLM represents the annual student-credit-hour output for that department and course level. Figure 1 shows, for example, that a total of 3,480 student credit hours was taught through business undergraduate courses. This total will be used to compute unit costs in the department in the next step of the cost study. That is, this figure for total student credit hours, along with an estimate of the direct cost to teach undergraduates business courses (from step 3), will permit computation of the average cost per credit hour.

Figure 1 illustrates an approach used by some institutions in which only a few departments are included specifically in the cost study and the "other" category accounts for all the rest. The same is true for majors.

Creating an Instructional Work Load Matrix requires a tabulation of the course work taken by each student enrolled during each term in the year of the cost study. Student-registration records maintained by the school are the basis for this tabulation. Since student-registration information is one of the most common types of data maintained on computer systems, and since generally there are large volumes of data involved, this tabulation should be done, if possible, using a computer system. The development of the IWLM is the only part of the cost study that depends on computer assistance. Two alternatives were used with the pilot colleges: (1) using an NCHEMS software package to perform the necessary computations or (2) having the computer-center staff write the necessary computer programs to perform the same calculations.

The Student Data Module (SDM) of the NCHEMS Costing and Data Management System (CADMS) is a set of software that can be used to construct the IWLM (Haight 1975b). The software is generalized[4]

4. Generalized software is designed for use at any type of institution (public, private, two-year, or four-year). A definition of the campus organization (departments, majors, course/student levels) is provided as input data to the software.

for use on most campuses that have medium-sized computers and are able to format the necessary student-registration data for input to the system. A description of this software package is provided in appendix C.

If computer hardware is available but the campus is not compatible with the NCHEMS Costing and Data Management System, the campus should consider designing its own programs to calculate the IWLM. A majority of the small colleges in the pilot group developed their own IWLM software for their own computers. Appendix D provides the necessary detail on the computations for developing computer-program logic.

An important consideration in the development of the IWLM is use of the definitions agreed upon in the first cost-study step. The definitions of student majors, student levels, departments, and course levels effectively define the rows and columns in the IWLM. These also represent *cost centers* for which unit costs will be computed in later steps.

Step 3: Departmental-Cost Analysis for Instruction

The purpose of this step is to estimate the direct cost and unit cost for each instructional department. Data will be collected to document the various activities that occur within a department and to assign departmental expenditures to each activity. Departmental activities include teaching courses, departmental administration or chairmanship, research, and so forth. The technique to estimate the cost of departmental activities (1) analyzes the time faculty spend working in each activity area, (2) prorates faculty salaries in proportion to the time spent, and (3) prorates all other departmental costs in proportion to the distribution of faculty salaries.

An informal approach is recommended to determine the time faculty spend working in various departmental activity areas. It involves using whatever data are already available, such as class schedules that document each faculty member's course assignments—rather than adopting a more formal approach in which all faculty members are asked to report the time they spend on each departmental activity.[5] In a small college, existing data on departmental teaching assignments can be augmented with other data about the special assignments or activities of faculty. The pilot data about the special assignments or activities of faculty. The pilot schools found that a reasonably accurate and complete picture of departmental activities could be obtained from academic deans and department chairpersons with a minimum of inconvenience to faculty.

5. A further discussion of faculty self-report surveys is provided in *Faculty Activity Analysis: Overview and Major Issues* (Romney 1971).

When a faculty member carries a light teaching load in order to provide an administrative service, the analysis of departmental costs will assign a portion of the instructional cost to that administrative area. Examples of such service roles are departmental chairpersons, athletic coaches, choir or band directors, newspaper editors, or joint administrative appointments, such as directors of the computer center. In a similar fashion, the cost study will consider the time administrative staff spend teaching as an instructional cost to the institution. In this case, the cost study will transfer some of the administrative office expense to the instructional department in which the teaching is done. The purpose again is to arrive at an accurate estimate of actual costs incurred in providing instructional services.

It is frequently the case in small colleges that a faculty member is paid and housed in a single department but teaches in two or more departments. Another purpose of this analysis, therefore, is to assign costs to the departments where faculty are utilized. Additionally, there is the need to distribute costs to course levels within each department.

In a small college, the bulk of each faculty member's work load is in teaching. Course contact hours were selected by the pilot schools as the basis for distributing faculty time because (1) contact hours were considered an accurate estimator of the time faculty spend working in various instructional areas; (2) contact-hour data were available on each campus and therefore minimized the data-collection effort; and (3) noninstructional-assignment roles for faculty, such as chairpersons, could be represented in terms of equivalent-course contact hours. When contact hours are used as a measure of time, all noninstructional activities of faculty must be expressed using the same contact-hour measure. Some pilot campuses had a formal policy for assigning equivalent-course contact hours to all noninstructional assignments. On many such campuses, the contact hours for noninstructional faculty assignments are referred to as *release time*, denoting a release from instructional assignments.

Figure 2 is an example of the data collected on faculty assignments for each faculty member paid by an education department. Service roles in the department include physical-education instructors, elementary-education instructors, departmental chairpersons, and athletic coaches. Leon Cohen of the education faculty also team teaches sociology courses. The Departmental Data Form shown in the figure summarizes the total annual contact hours[6] assigned to faculty members for their instructional and administrative responsibilities. Note that administrative assignments, such as the chairmanship, are expressed in terms of course contact hours or release time.

6. On the Departmental Data Form, the category called time is a measure of the time faculty spend in various activity areas. Faculty contact hours are used throughout the discussion and examples as a proxy for faculty time.

FIGURE 2

FACULTY ASSIGNMENTS

DEPARTMENTAL DATA FORM

Department Name: Education Department

Faculty Name	Salary	FTE	ASSIGNMENTS Type	Department	Level	Time	Course Credits Taught
Charles Haden	$14,500	1.00	Instruction	P.Ed.	Undergrad	9	6
			Instruction	P.Ed.	Graduate	9	6
			Instruction	Elem.Ed.	Undergrad	6	6
						24	
Nancy Simone	$16,200	1.00	Instruction	Elem.Ed.	Undergrad	18	18
			Chairperson	Education		6	
						24	
Leon Cohen	$9,025	.50	Instruction	Elem.Ed.	Undergrad	6	6
			Instruction	Sociology	Undergrad	6	12
						12	
Tony Braxton	$12,500	1.00	Instruction	P.Ed.	Undergrad	12	9
			Coaching			12	
						24	

The total course credits taught at each course level also are included on the form. Charles Haden, for example, teaches three two-credit undergraduate physical-education courses annually for a total of six course credits and an annual contact-hour work load of 9 hours. (With physical-education courses, as with laboratories, the hours per week required of faculty for formal course contact frequently are not equivalent to the course credits; this example typifies the difference between the two.) Faculty salaries entered on the Departmental Data Form are those actually paid the faculty member for the period of analysis, and FTE represents the annual Full-Time Equivalency for the faculty member as recorded in payroll or personnel records. Note that each full-time faculty member has an annual work load of 24 contact hours. It is also the case in small colleges that faculty will work more than a typical full-time load. In such cases, their FTE is still 1.0 unless they are paid a salary increment for their overload.

In figure 3, the first computations are performed using the Departmental Data Form for the education-department faculty. Here the salary and FTE for each faculty member are distributed to their respective assignment areas. Both salary and FTE are distributed in proportion to the contact hour or time distribution. The nine contact hours Charles Haden spends teaching undergraduate physical-education courses are first converted to a percentage of his annual work load (9/24 = 37.5 percent) and entered as the Distributed Time (①). Similar calculations are made for the remainder of his activities. The Distributed Time is then multiplied by his salary and FTE to compute the entries for the Distributed Salary (②) and Distributed FTE (③) columns. Where undergraduate physical-education courses require 37.5 percent of Charles Haden's time, there is an estimated cost of $5,438 (37.5 percent of $14,500). For each faculty member, the distributed salary and FTE are totaled to insure there are no errors in computations. Note that faculty members in figure 3 each have more than one assignment, thereby requiring calculations to distribute their salary and FTE. When a faculty member works entirely in a single activity or assignment area (for example, only teaching undergraduate physical-education courses), no distribution computations are required. Figure 4 illustrates an accumulation of the *other* education faculty having single assignments. For example, there is a total of 2.30 FTE faculty who teach only undergraduate elementary-education courses and are paid a total of $40,100 annually. Their total contact and credit hours are recorded to be used later in cost analysis. By summarizing the faculty who have assignments in single activity areas, the amount of data collection and computation is reduced substantially.

FIGURE 3

DISTRIBUTED FACULTY SALARY AND FTE

DEPARTMENTAL DATA FORM

Department Name: EDUCATION

Faculty Name	Salary	FTE	ASSIGNMENTS Type	Department	Level	Time	Course Credits Taught	COST COMPUTATIONS (1) Distributed Time	(2) Distributed Salary	(3) Distributed FTE
Charles Haden	14,500	1.00	Instruction	P.Ed.	Undergrad	9	6	37.5%	5,438	.375
			Instruction	P.Ed.	Graduate	9	6	37.5%	5,438	.375
			Instruction	Elem Ed.	Ugrad	6 / 24	6	25 % / 100 %	3,625 / 14,501	.250 / 1.000
Nancy Simone	16,200	1.00	Instruction	Elem Ed.	Ugrad	18	18	75 %	12,150	.75
			Chairperson	Education		6 / 24		25 % / 100 %	4,050 / 16,200	.25 / 1.00
Leon Cohen	9,025	.50	Instruction	Elem Ed.	Ugrad	6	6	50 %	4,512	.25
			Instruction	Sociology	Ugrad	6 / 12	12	50 % / 100 %	4,512 / 9,024	.25 / .50
Tony Braxton	12,500	1.00	Instruction	P.Ed.	Ugrad	12	9	50 %	6,250	.50
			Coaching			12 / 24		50 % / 100 %	6,250 / 12,500	.50 / 1.00

FIGURE 4

OTHER DEPARTMENTAL FACULTY

DEPARTMENTAL DATA FORM

Department Name: EDUCATION (continued)

Faculty Name	Salary	FTE	ASSIGNMENTS: Type	Department	Level	Time	Course Credits Taught	COST COMPUTATIONS: (1) Distributed Time	(2) Distributed Salary	(3) Distributed FTE
Other Faculty teaching Elem Ed. - Ugrad	40,100	2.30	Instruction	Elem Ed.	Ugrad	55	55	100 %	40,100	2.30
Other Faculty teaching P.Ed. - Ugrad	30,300	2.35	Instruction	P.Ed.	Ugrad	57	39	100 %	30,300	2.35
Other Faculty teaching P.Ed. - Grad	24,375	1.60	Instruction	P.Ed.	Grad	39	26	100 %	24,375	1.60
DEPARTMENTAL TOTAL (Includes data from figure 3)	147,000	9.75								

Table 2 summarizes the assignment and distribution data for the physical-education undergraduate courses. A total of 54 course credits was taught, using an estimated 3.22 FTE at a faculty-salary cost of $41,988. The totals for physical-education undergraduate courses and all other activities are summarized on the Departmental Cost Analysis form shown in figure 6. The figures for Total Faculty salary ($147,000) and Total Faculty FTE (9.75) on the Departmental Cost Analysis Form should be the same as those on the previous Departmental Data Forms shown in figures 3 and 4.

TABLE 2

SUMMARY FOR PHYSICAL-EDUCATION UNDERGRADUATE COURSES

FACULTY MEMBER	CONTACT HOURS	COURSE CREDITS	SALARY	FTE
Charles Haden	9	6	5,438	.375
Tony Braxton	12	9	6,250	.50
"Other" faculty	57	39	30,300	2.35
	78	54	41,988	3.225

The cost-analysis form in figure 5 is used to distribute all the department's year-end expenses. Using the distribution of faculty salaries, the total annual expenses for the department will be prorated among activities. Physical-education undergraduate courses, with a faculty cost of $41,988, represent 28.6 percent of total salaries ($147,000). The same proportion of total departmental expenses becomes the Distributed Departmental Costs. For example, $55,983 is the proportion of education-department cost that is prorated to physical-education undergraduate courses ($196,000 = $55,983 × 28.6 percent). The same is done for all other departmental activities. This implies that all the expenses in an academic department are attributed to activities in proportion to the distribution of faculty time and salary. It is the same technique used in *Procedures for Determining Historical Full Costs.* When comparisons are made across departments or for the same department across years, it is important that the methodology applied be both consistent and a near approximation of the actual process being measured.

In figure 5, the Transfers and Net Costs columns are used to show the transfer of cost and FTE to other departmental areas. Since Leon Cohen spent part of his work load teaching sociology courses, the cost attributed to that activity will be transferred to the sociology department. (The Departmental Cost Analysis for the sociology department is shown later to further illustrate this transfer.)

FIGURE 5

SUMMARY OF DEPARTMENTAL COST

DEPARTMENTAL COST ANALYSIS

Department Name: EDUCATION DEPARTMENT

Account Year-end Balance: $196,000

Department Activities	Course Contact Hours	Course Credit Hours	Total Faculty Salary	Total Faculty FTE	Distributed Departmental Costs	Transfers	Net Costs
Instruction:							
P.Ed. Undergraduate	78	54	$ 41,988	3.22	$ 55,983		$55,983
P.Ed. Graduate	48	32	29,813	1.98	39,749		39,749
Elem. Educ. Undergrad	85	85	60,387	3.55	80,515		80,515
Sociology	6	12	4,512	.25	6,015	(To Sociology)	-0-
Coaching Athletics			6,250	.50	8,332		8,332
Department Chairperson			4,050	.25	5,400		5,400
			$147,000	9.75	$195,994		

FIGURE 6

DEPARTMENTAL COST ANALYSIS

DEPARTMENTAL COST ANALYSIS

Department Name: EDUCATION DEPARTMENT

Account Year-end Balance: $196,000

Department Activities	Course Contact Hours	Course Credit Hours	Total Faculty Salary	Total Faculty FTE	Distributed Departmental Costs	Transfers	Net Costs
Instruction:							
P.Ed. Undergraduate	78	54	$ 41,988	3.22	$ 55,983		$55,983
P.Ed. Graduate	48	32	29,813	1.98	39,749		39,749
Elem. Educ. Undergrad	85	85	60,387	3.55	80,515		80,515
Sociology	6	12	4,512	.25	6,015	(To Sociology)	-0-
Coaching Athletics			6,250	.50	8,332		8,332
Department Chairperson			4,050	.25	5,400		5,400
			$147,000	9.75	$195,994		

* * * COST ANALYSIS * * *

Course Levels	Net Cost	Student Credit Hours	1 Avg. Cost/ Cr. Hr.	2 Avg. Class Size	3 Avg. Faculty Salary	4 Average Contact Hour Faculty Load	5 Average Credit Hour Faculty Load
P.Ed. Undergrad	$55,983	1,340	$ 41.78	25	$13,040	24	17
P.Ed. Grad	39,749	288	138.02	9	15,057	24	16
Elem. Ed. Ugrad	80,515	2,115	38.07	25	17,010	24	24

Figure 6 includes an analysis of cost for the major instructional activities in the department. Each instructional activity and course level is identified with its previously calculated Net Cost. Student Credit Hours are obtained from the IWLM information tabulated in step 2 and illustrated in figure 1. The remaining entries are computed using data shown on the form. The following discussion describes the computations and the resulting measures. Physical-education undergraduate course level is used as an example.

1. **Average Cost per Credit Hour:** This represents departmental *unit cost* and is computed by dividing Student Credit Hours into Net Cost ($41.78 = $55,983 ÷ 1,340). This represents the average cost last year (or for the period of analysis) to teach a credit hour in this discipline at this course level. When compared across departments or course levels, it shows the relative difference in operating cost for each area. Step 6, Interpretation of Results, will further explain the significance of this and other measures resulting from the cost analysis.

2. **Average Class Size:** This represents the average number of head-count students per course section and is computed by dividing Course Credit Hours into Student Credit Hours (25 = 1,340 ÷ 54).

3. **Average Faculty Salary:** This is a measure of the average salary paid to faculty teaching courses at this course level. It is computed by dividing Total Faculty FTE into Total Faculty Salary for each course level ($13,040 = $41,988 ÷ 3.22).

4. **Average Contact-Hour Faculty Work Load:** This is the average work load for faculty members at this course level. It is calculated by dividing Total Faculty FTE into Course Contact Hours (24 = 78 ÷ 3.22).

5. **Average Credit-Hour Faculty Work Load:** This figure shows the average annual course credit hours taught by each faculty member. It results from dividing Total Faculty FTE into Course Credit Hours (17 = 54 ÷ 3.22).

The same calculations are performed for each academic department being analyzed. The cost data that result from these computations represent estimates of the actual costs incurred in providing the activities of the department. Figure 7 illustrates the cost analysis for the sociology department where the cost associated with Leon Cohen's (education department) sociology teaching is accumulated with other sociology-instruction cost.

FIGURE 7

SOCIOLOGY COST ANALYSIS

DEPARTMENTAL COST ANALYSIS

Department Name: SOCIOLOGY DEPARTMENT

Account Year-end Balance: $198,000

Department Activities	Course Contact Hours	Course Credit Hours	Total Faculty Salary	Total Faculty FTE	Distributed Departmental Costs	Transfers	Net Costs
Instruction:							
Sociology - Undergraduate	6	12	4,512	.25	6,015	(from Education)	
Sociology - Undergraduate	131	117	93,614	5.45	124,819		
Sociology - Graduate	60	39	46,486	2.50	61,981		61,981
Department Chairperson			8,400	.50	11,200		11,200
			148,500	8.45			
Accumulated Soc. Ugrad	137	129	98,126	5.70	130,834		130,834

These computations do not include the amount transferred from Education.

* * * COST ANALYSIS * * *

Course Levels	Net Cost	Student Credit Hours	Avg. Cost/ Cr. Hr.	Avg. Class Size	Avg. Faculty Salary	Average Contact Hour Faculty Load	Average Credit Hour Faculty Load
Soc. Undergrad	$130,834	4,125	$ 31.72	32	$17,215	24	23
Soc. Grad.	61,981	540	114.78	14	18,594	24	16

Using data from previous steps, it is possible to estimate the total annual cost of student programs (majors) and, within each program, the average cost per student. The Instructional Work Load Matrix developed in step 2 provides the total credit hours taught by a discipline to each student major. The departmental-cost analysis performed in step 3 provides an estimate of the total and average costs to operate each instructional department at each course level (undergraduate and graduate). These data are used to prorate departmental cost among majors in proportion to the credit hours taught by the department to each major.

Table 3 illustrates the proration of physical-education departmental expenses among those student majors taught by the department. In the figure, the majors taking physical-education courses (undergraduate course level) are listed with the credit hours each major completed (from figure 1). The credit hours are converted to a percentage, shown as Distribution Percentages, when each is divided by the total credit-hour production for the department (1,340). The net cost of $55,983 estimated for the department and course level (from step 3) is then allocated among the student majors in proportion to the Distribution Percentages; this gives the Program Cost Allocation data. Note that the sum of Program Cost Allocations is approximately equal to total departmental expenses ($55,983) allocated. Note also that when the average cost per credit hour for physical-education undergraduate courses is multiplied by the Student Credit Hours taken by a particular major (history, for example), the Program Cost Allocation is approximated ($41.78 × 20 = $835.60). This technique is the one used by the NCHEMS Costing and Data Management System software, and it also will be used here to ease computational work required in this step.

TABLE 3

PROGRAM COSTING COMPUTATIONS

Department/course level: Physical Education—Undergraduate
Estimated departmental costs: $55,983 Unit cost: $41.78

STUDENT MAJORS TAUGHT	STUDENT CREDIT HOURS	DISTRIBUTION PERCENTAGES	PROGRAM COST ALLOCATION
History (undergrad)	20	1.49	834.15
Pol. Sci. (undergrad)	30	2.24	1,254.01
Sociology (undergrad)	40	2.99	1,673.89
Psychology (undergrad)	50	3.73	2,088.16
Other Majors (undergrad)	1,200	89.55	50,132.77
	1,340	100.00%	55,982.98

The Program Cost Allocation shown in table 3 is the contribution of cost to a major by a single department and course level. The same computations must be performed for each department and course level. When cost allocations are completed, the cost prorated to each major then can be accumulated to produce an estimate of total program cost.

As an aid in the computation of program costs, the Data for Program Costing form shown in figure 8 can be used. Data included on the form were obtained from the IWLM in step 2 and the cost analysis in step 3. For each row (discipline and course level), the annual cost per credit hour is multiplied by the credit hours for each major and student level. The result of this computation is then entered in the corresponding Cost Allocation column. Figure 9 shows the results obtained from these calculations. In the figure, 60 undergraduate business credit hours were taught to undergraduate history majors. At an average cost of $28.75 per credit hour for this department and course level, the cost allocation to the program is $1,725. Additional accumulations are made on the form illustrated in figure 9 and are described below:

1. **Total Program Credit Hours:** An accumulation of the total student credit hours taken by all the students in this major and at this student level (for example, 300).
2. **Total Program Cost:** The sum of Cost Allocations to each major and student level (for example, $9,429.10).
3. **Cost per Program Credit Hour:** The computed average cost per credit hour in the major and student level. This is the result of dividing Total Program Credit Hours into Total Program Cost (for example, $31.43 = $9,429.10 ÷ 300).
4. **Cost Per Student:** The average annual cost per FTE student. This is computed by multiplying the Cost Per Program Credit Hour by 30 (30 is a common definition of an FTE undergraduate student in a college on a semester system). The figure shows the average cost per undergraduate history student of $943. Note that for graduate-student levels the FTE definition used in the example was 24. The specific definition of FTE student to be used in the analysis should be provided by the institution conducting the cost study.

STEP 5: ANALYSIS OF NONINSTRUCTIONAL COST

The previous steps are designed to produce direct and unit costs for instructional areas. In most institutions, however, instructional costs are only about half the total expenditures in the current funds, with the remaining expenditures incurred for activities or services—such as libraries,

FIGURE 8

DATA FOR PROGRAM COSTING

DISCIPLINES	$ PER CREDIT HOUR	History				Political Science			
		Undergraduate Students		Graduate Students		Undergraduate Students		Graduate Students	
		CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation
Business Undergraduate Courses	$ 28.75	60				90			
Graduate Courses	52.10							15	
Elem. Ed. Undergraduate Courses	38.07					45			
Graduate Courses	0								
Sociology Undergraduate Courses	31.72	150				90		15	
Graduate Courses	114.78								
Phys. Ed. Undergraduate Courses	41.78	20				30			
Graduate Courses	138.02								
Other Undergraduate Courses	30.15	70				195		15	
Graduate Courses	55.85			120				75	

FIGURE 9

PROGRAM COST COMPUTATIONS

DISCIPLINES	$ PER CREDIT HOUR	History				Political Science			
		Undergraduate Students		Graduate Students		Undergraduate Students		Graduate Students	
		CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation	CREDIT HOURS	Cost Allocation
Business Undergraduate Courses	$ 28.75	60	$1,725.00			90	$2,587.00		
Graduate Courses	52.10							15	$781.50
Elem. Ed. Undergraduate Courses	38.07					45	1,713.15		
Graduate Courses	[illegible]								
Sociology Undergraduate Courses	31.72	150	4,758.00			90	2,854.80	15	475.80
Graduate Courses	114.78								
Phys. Ed. Undergraduate Courses	41.78	20	835.60			30	1,253.40		
Graduate Courses	138.02								
Other Undergraduate Courses	30.15	70	2,110.50			195	5,879.25	15	452.25
Graduate Courses	55.85			120	$6,702.00			75	4,188.75
Total Program Cost		300		120		450		120	
Total Credit Hours			$9,429.10		6,702.00		14,288.10		5,898.30
Cost Per Program Credit			$ 31.43		55.85		31.75		49.15
Cost Per Student			$ 943.00		$1,340.00		$ 952.00		$1,474.00

computer centers, and business offices—that support instruction. Many campuses, therefore, consider the study of these support services as important as the analysis of instruction.

One difficulty in the analysis of noninstructional costs is finding a common denominator that can be used for the derivation of unit costs. There is no convenient measure of the units produced, such as the student credit hours used in instructional areas. For that reason, this step will produce only total costs in the various noninstructional areas. If subsequent analysis of the resulting data requires some measure of activity (process) or the outcome of the services unit, the user may wish to consult *Program Measures* (Topping and Miyataki 1973). The document lists the following measures, for example, for the volume of activity in a college's financial-aid unit:

- Total dollar amount of aid administered, by type of aid, such as a loan, grant, work-study
- Students requesting financial-aid counseling
- Student-aid applications processed, by level of student and socio-economic group of students

For the same financial-aid services *Program Measures* gives examples of measures of outcomes or results produced by the function that include:

- Students attending the institution who would not otherwise
- Students granted aid as a percent of applicants
- Average dollar amount of aid granted, by type of aid
- Average percentage of financial need met for those students granted aid
- Lag time between requesting aid and receiving confirmation of aid, by type of aid
- Loan defaults, by type of loan

This chapter provides a means for the collection of data about support-area costs in a format that is useful for data exchange or programmatic analysis of results. The format used is from the *Information Exchange Procedures Activity Structure* (Myers and Topping 1974) as illustrated in table 4. Such a structure is used to analyze data outside the conventional organizational structure used in most financial charts of accounts. For the pilot schools, the cost centers used in the analysis of support-area costs were a version of the framework shown in table 4. The schools used these cost centers partly to aid in the exchange of data and partly as a starting point for their cost analysis. Each campus later considered modifications

TABLE 4

SUPPORT-AREA COST CENTERS

IEP ACTIVITY STRUCTURE

Code	Title
1.1.XXXX.XX	General Academic Instruction (delineated to discipline and course level)
1.1.XXXX.XX	Occupational and Vocational Instruction (delineated to discipline and course level)
1.3	Community Education
1.4	Preparatory and Adult Basic Education
2.1	Institutes and Research Centers
2.2.XX00	Individual or Project Research (delineated to program category)
3.1	Patient Services
3.2	Community Services
3.3	Cooperative Extension Services
3.4	Public Broadcasting Services
4.1	Libraries
4.2	Museums and Galleries
4.3	Audiovisual Services
4.4	Computing Support
4.5.XX00	Ancillary Support (delineated to program category)
4.6.XX00	Academic Administration (delineated to program category)
4.7.XX00	Course and Curriculum Development (delineated to program category)
4.8.XX00	Academic Personnel Development (delineated to program category)
5.1	Student Service Administration
5.2	Social and Cultural Development
5.3	Counseling and Career Guidance
5.4	Financial Aid Administration
5.5	Student Auxiliary Services
5.6	Intercollegiate Athletics
6.1	Executive Management
6.2	Fiscal Operations
6.3	General Administrative Services
6.4	Logistical Services
6.5	Physical Plant Operations
6.6	Faculty and Staff Auxiliary Services
6.7	Public Relations and Development
6.8	Student Recruitment, Admissions and Records
6.9	Central Office Operations (*)
7.1	Independent Operations/Institutional
7.2	Independent Operations/Outside Agencies
8.1	Scholarships
8.2	Fellowships
8.3	Provision for Doubtful Student Loans (*)
9.1	Cost of Purchases for Resale (*)
9.2	Current Year's Capital Expenditures (*)
9.3	Rental Expenditures-Buildings & Land Improvements (*)
9.4	Capital Cost-Buildings and Land Improvements (*)
9.5	Rental Expenditures-Equipment (*)
9.6	Capital Cost-Equipment (*)

*Additional activities not found in the Program Classification Structure but used in the IEP cost study.

FIGURE 10

SUPPORT COST-CENTER CROSSOVER

Crossover Worksheet

Support Cost Center: 5.4 Financial Aid Administration

Accounts Crossed into this cost center		Amount
(01-157510-100)	Financial Aid department salaries	$125,000
(01-157510-200)	Financial Aid department supplies	28,000
(01-157510-300)	Financial Aid department equipment	18,000
	TOTAL	

to this framework to aid in the use of data for analysis of internal operations or to improve the compatibility of data exchanged among themselves.

The campus conducting the cost study must consider the purpose of the analysis in deciding what set of cost centers should be used in this step. If the data are being collected for internal analysis only and there is no intention to exchange data with other institutions, it might be more appropriate to use a framework more closely aligned with the campus organizational structure. When the IEP Activity Structure is used, there must be a crossover[7] of year-end financial expenditures from organizational accounts to the cost centers used in the analysis.

For data exchange, the *Procedures for Determining Historical Full Costs* provides a definitive set of rules for crossover. Using a form similar to that shown in figure 10, the crossover can be completed without the use of computer-based software. The figure is an example of crossover

TABLE 5

SUMMARY OF FINANCIAL CROSSOVER

2.1	Institutes and Research Centers	$185,250
2.2	Individual or Project Research	28,500
3.1	Community Services	88,000
4.1	Libraries	160,000
4.2	Museum and Galleries	35,000
4.3	Audiovisual Services	19,200
4.4	Computing Support (Academic)	48,400
4.5	Academic Administration	85,000
4.7	Course and Curriculum Development	44,800
4.8	Academic Personnel Development	115,000
5.1	Student Service Administration	44,500
5.2	Social and Cultural Development	95,000
5.3	Counseling and Career Guidance	81,000
5.4	Financial Aid Administration	171,000
5.6	Intercollegiate Activities	140,500
6.1	Executive Management	105,000
6.2	Fiscal Operations	94,000
6.3	General Administrative Services	180,700
6.4	Logistical Services	65,000
6.5	Physical Plant Operations	275,000
•	•	•
•	•	•
•	•	•

7. *Crossover* refers to the mapping of expenditure data from one or more accounts in the campus chart of accounts to one or more cost-analysis cost centers.

for the expenses associated with the administration of financial aid into the IEP cost center.

IEP Activity Structure provides a lookup table, including common institutional account names and the IEP cost center into which they are mapped. Also, *Procedures for Determining Historical Full Costs* includes a discussion of special circumstances that must be addressed, such as pooled expenses, restricted-fund accounts, donated services, and use charges (or depreciation) of capital assets.

A form similar to that in figure 10 is used for each IEP cost center. When completed, they will include all the financial expenditures for the campus in the current funds during the period of analysis. These forms provide a convenient audit trail to assist in reconciling the results. A summary of the financial crossover is shown in table 5.

STEP 6: INTERPRETATION OF RESULTS

Once the mechanics of the cost study are complete, the results must be interpreted and explained to campus administrators. This step outlines an approach that will be helpful in interpreting results and identifying areas for further analysis. The material in this step is a synthesis of suggestions in *Procedures for Determining Historical Full Costs* and a companion document, *IEP Analysis and Use: Single-Institution Data* (Byers and Bower 1975).

The overriding objective in using historical-cost information is to gain a perspective on the past allocation and use of institutional resources. The comparative analysis of cost data will do no more than to point out unusual patterns in cost trends over time or across units within the same time period. It is generally the case that unusually high or low expenditure patterns must be analyzed more closely to understand further the reasons for the differences and to determine whether any changes can be effected in future operating periods.

With the availability of cost-analysis information, many institutions begin to see themselves in a new light and to ask questions that they can try to answer on the basis of their newly acquired knowledge of resource-use patterns. A study of 12 schools involved in the Information Exchange Procedures project, *Profiles of Management Information Uses* (Huff and Young 1974), outlines the changes that resulted on each campus. The information uses described in that document are numerous and varied; they include resource allocation, curriculum development, contract negotiations, budget preparation, cost explanation, and accreditation self-studies. The data were used at the level of the department; the school, or college

or division; and the overall institution. Specific users have included department heads, deans, academic senates, institutional research directors, vice-presidents (for academic affairs, student affairs, budget and finance), presidents, system officers, and boards of trustees. In each case, the positive impacts on campus management were the result of administrators bringing new knowledge to bear on a management question or problem.

IEP Analysis and Use provides helpful suggestions on the display and analysis of cost data. It approaches the use of cost-analysis data from two perspectives. The first begins with the existence of a particular data set (similar to that produced in the first five steps of this guide) and asks: What are the best ways of presenting the data set so that it will serve some immediate purposes for the institutional user and stimulate the user to discover additional applications? The second approach starts with a question of concern to the institution and considers the extent to which the data will aid in understanding the issues surrounding it. The analytical study section of the document assists in investigating such questions as:

- Why does department X have costs that are twice as high as a similar department's costs?
- What factors account for the relatively low costs for students in degree program Y?
- Why are 80 percent of students in program X able to obtain jobs after graduation while only 40 percent of students in program Y are able to do so?
- What student characteristics help to explain why the average student in program X takes five years to complete a degree?

The planning and management questions listed above and addressed in the data-uses document obviously require a broader set of data than that available through this cost analysis. The document serves, however, to make the point that cost-analysis data are a useful component in most such analyses, requiring related descriptive data. It also stresses the importance of having executives understand the data that are available from such cost studies.

The remainder of this chapter provides suggestions for the interpretation of cost-analysis data. Examples of the tables that can be constructed using data from this cost study are included in tables 6 and 7 and figure 11. In table 6, the student-credit-hour totals from the IWLM are shown with direct-cost data to point out those areas in which there are significant differences between the proportion of student credit hours produced and the associated proportion of institutional resources used. Table 7 illustrates direct unit cost in rank-ordered sequence for all disciplines. A similar table

TABLE 6

COMPARISON OF CREDIT HOURS AND DIRECT-COST DATA

DISCIPLINES	STUDENT CREDIT HOURS		DIRECT COSTS		
	Number	% of Institutional Total	Total $	% of Institutional Total	Unit Cost
	A	B	C	D	E
Aerospace science	1,604	0.6	$ 40,100	0.6	$25
AF ROTC	302	0.1	24,462	0.3	81
Anthropology	10,907	3.8	207,233	2.9	19
Art	14,175	5.0	197,675	4.2	21
Biological Science	9,099	3.2	209,277	2.9	23
Botany	1,369	0.5	39,701	0.6	29
Business Administration	17,286	6.1	276,576	3.9	16
Business Education	5,931	2.1	166,068	2.3	28
Chemistry	6,549	2.3	281,607	3.9	43
Chinese	198	0.1	5,742	0.1	29
Communications	1,379	0.5	33,096	0.5	24
Computer Science	683	0.2	28,003	0.4	41
Drama	2,988	1.0	98,604	1.4	33
Economics	5,947	2.1	184,357	2.6	31
Education	44,572	15.6	1,515,448	21.1	34
English	16,665	5.8	399,960	5.6	24
Environmental Studies	953	0.3	20,966	0.3	22
Ethnic Studies	2,011	0.7	68,374	1.0	34
Exploratory Studies	661	0.2	7,932	0.1	12
French	1,390	0.5	48,650	0.7	35
Geography	4,996	1.7	114,908	1.6	23
Geology	3,056	1.1	76,400	1.1	25
German	1,257	0.4	38,967	0.5	31
Health	6,155	2.2	110,790	1.5	18
History	9,462	3.3	198,702	2.8	21
Home Economics	7,799	2.7	194,975	2.7	25
Humanities	3,019	1.1	33,209	0.5	11
Law and Justice	1,010	0.4	28,280	0.4	28
Leisure Studies	2,809	1.0	64,607	0.9	23
Mathematics	12,435	4.4	261,135	3.6	21
Music	13,547	4.7	406,410	5.7	30
Philosophy	4,031	1.8	125,775	1.8	31
Physical Education	11,879	4.2	439,523	6.1	37
Physics	3,590	1.3	96,930	1.4	27
Political Science	4,112	1.4	106,912	1.5	26
Psychology	27,810	9.7	361,530	5.0	13
Religious Studies	185	0.1	3,145	0.1	17
Safety Education	326	0.1	12,062	0.2	37
Social Science	617	0.2	19,127	0.3	31
Sociology	13,157	4.6	210,512	2.9	16
Spanish	3,375	1.2	97,875	1.4	29
Technical/Industrial Education	3,229	1.1	138,847	1.9	43
Zoology	2,036	0.7	73,296	1.0	36
INSTITUTIONAL TOTAL	285,561	100.0*	$7,167,748	100.0*	

*Detail may not add due to rounding

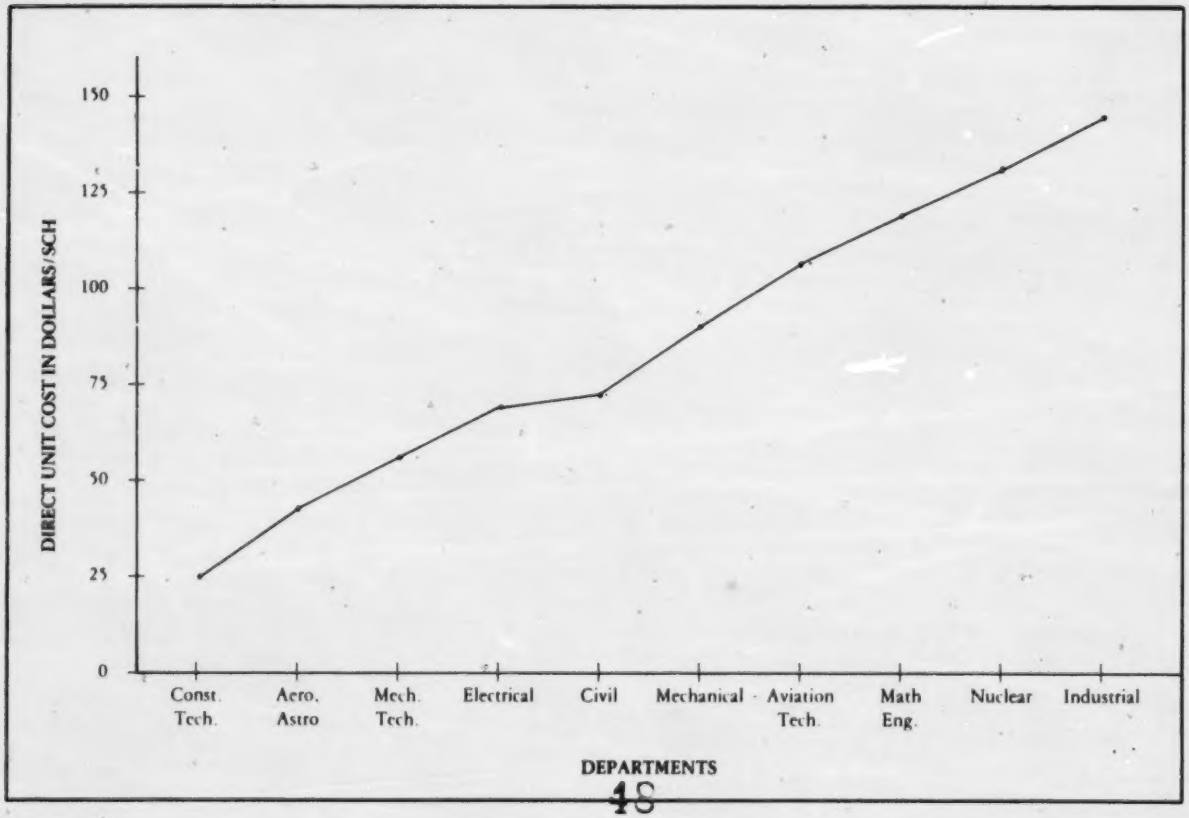
TABLE 7

RANK-ORDERED DISCIPLINE DATA

RANK	DEPARTMENT NAME	CREDIT HOURS	TOTAL DIRECT COST	DIRECT UNIT COST
1	Education—Other	1,180	$ 9,310	$ 7.89
2	Archaeology	126	1,078	8.55
3	Public Adm./Mgmt.	2,138	19,510	9.13
4	Public Services	106	1,086	10.25
5	Oceanography	1,786	19,364	10.84
6	Banking & Finance	3,648	43,981	12.06
7	Fire Control	870	11,336	13.03
8	Art History	2,035	28,676	14.09
9	Criminology	643	9,164	14.25
10	Geography	1,403	20,347	14.50
11	Elementary Education	14,210	215,015	15.13
12	Chinese	226	3,745	16.57
13	English	2,142	37,378	17.44
14	Psychology	7,081	123,637	17.46
15	Law Enforcement	1,132	20,812	18.39
16	Home Economics	10,584	199,858	18.88
17	Community Service	2,918	55,415	18.99
18	Inhalation Ther.	870	17,558	20.18
19	Economics	2,898	61,700	21.29
20	Urban Studies	336	7,291	21.70
21	History	6,162	136,387	22.13
23	Surgical	855	19,077	22.31
24	Accounting	5,983	135,401	22.63
25	Business Statistics	570	13,687	24.01
26	Spanish	1,206	31,117	25.80
27	Cinematography	386	10,594	27.45
28	Comp. Operator	484	13,681	28.27
29	Secretarial	11,273	323,481	28.70
30	Diesel	3,888	121,147	31.16
31	Const. Buildings	8,558	266,866	31.18
32	Comp. Programmer	5,238	167,196	31.92
33	Automotive	9,747	316,194	32.44
34	Nursing, Pract.	6,407	207,935	32.45
35	Welding	5,224	180,497	34.55
36	Dental Asst.	1,534	58,798	38.33
37	Photography	1,415	56,091	39.64
38	Agriculture	1,080	57,202	52.96
39	Hotel—Rest.	1,207	73,805	61.15
40	Math/Science	119	10,226	85.93
41	Engineering	205	18,375	89.63
42	Team Sports	96	12,486	130.06
43	Org. Chemistry	66	10,557	159.95
44	Physical Science	56	11,084	197.93

FIGURE 11

LOWER-DIVISION DEPARTMENTAL CLUSTER (HEGIS CATEGORY 0900, ENGINEERING)
BY DIRECT UNIT COST, LARGE-RESEARCH-UNIVERSITY DATA, 1973-74



can be constructed for student majors. These data are sometimes more easily understood when displayed graphically as shown in figure 11. Each of these illustrations is helpful in presenting a summary of the results of the cost study. (The illustrations are extracted from *IEP Analysis and Use*; other ideas for illustrating or analyzing results are given there.)

In their Fundamental Cost Model, Gulko and Sheehan (1976) point out the importance of examining the factors that influence cost variations, since institutional policymaking is directed at these factors (such as average section size or faculty salaries) rather than at the unit costs themselves. Average cost per credit hour, then, becomes an indicator that is useful in monitoring academic operations, rather than a policy variable that must be managed itself. The Fundamental Cost Model provides a simplified version of departmental unit cost that uses only the faculty expense. Since the methodology in the present document assumes that other departmental costs follow in proportion to faculty expense, the model is useful in interpreting the results of our cost analysis. The Fundamental Cost Model is represented in the formula:

$$\text{Instructional Unit Cost} = \frac{\text{Average Faculty Salary}}{\text{Avg. Class Size} \times \text{Avg. Faculty Work Load}}$$

In table 8, using the cost-analysis data from the education and sociology departments (see figures 6 and 7), the average faculty cost per credit hour is computed from total faculty salaries and student credit hours produced. The faculty work load also is shown since it is a possible factor in the differences in unit costs. Academic administration would want to consider the possibility of changing some of these cost determinants to influence future unit costs.

TABLE 8

SUMMARY OF DEPARTMENTAL UNIT COSTS

DEPARTMENT	AVG. DEPT. COST/CR.HR.	AVG. FAC. COST/CR.HR.	AVG. FAC. SALARY	AVG. CLASS SIZE	AVG. FAC. WORK LOAD
P. ed. undergraduate	$ 42	$ 31	$13,040	25	17
P. ed. graduate	138	104	15,057	9	16
Elem. ed. undergraduate	38	29	17,010	25	24
Sociology undergraduate	32	24	17,215	32	23
Sociology graduate	115	86	18,594	14	16

Data in table 8 illustrate the sensitivity of unit-cost data to average class size. The most dramatic differences in unit costs occur in conjunction with drastic differences in average number of students per class or section. Further study is required to consider the actions that might influence this average class size and thereby change the unit cost. *Colleges and Money: A Faculty Guide to Academic Economics* (*Change* 1976), provides a useful discussion on the economics of instruction. It notes:

> A high price is paid by American higher education for curricular proliferation. In a study made by Howard Bowen and Gordon Douglass a few years ago (*Efficiency in Liberal Education*, McGraw-Hill 1971), a typical liberal arts college of 1,200 students was found to be able to offer a high-quality education with about 225 courses. In fact, most such colleges have two or three times this number of courses. . . . Wide variations in cost, ranging in this study from $277 to $202, result from changes in [instructional] methods. If one added in even greater potential changes in cost from reduced curricular proliferation, the new effect would be dramatic. Substantial savings are possible in many institutions without serious curtailment of quality. [Pp. 31-32]

A study of course proliferation in a small college is one way to consider the possibility of changing class sizes in academic departments. Colleges previously involved in case studies with NCHEMS have found that reducing the number of sections offered in a term, or offering a course once each year rather than in each term, is a useful approach to changing section sizes.

On closer examination of table 8, it is evident that salary and work load must all be examined as part of explaining why a unit-cost figure in a particular area (such as graduate courses taught in physical education) is significantly higher than that for other departments and course levels. The managerial task is to find ways to change one or more of the three cost determinants, or to accept the high cost of some types of instruction as a necessary and justifiable expense. Such decisions, of course, must consider the impact on curriculum, students, and faculty.

The experience at NCHEMS is that when administrators take an active role in the cost study—especially in interpreting and explaining its results—it is more likely that the cost-analysis process is more likely to benefit the college. This is not to suggest that college and university administration revolves around cost information. Yet there is evidence that the use of cost information can help administrative and academic executives carry out their planning and management responsibilities.[8]

8. See, for example, Adams, Kingston, and Schroeder (1978); Adams, Hankins, Kingston, and Schroeder (1978); Bacchetti (1971); Byers and Bower (1975); Huff and Young (1974); and Schroeder (1978). Further discussion will be found in appendix A.

APPENDIX A

Uses of and Approaches to Cost Information

This background on the use of cost analysis is excerpted from *Procedures for Determining Historical Full Costs,* 2nd ed. (Hughes and Topping 1977). The document was developed jointly by NCHEMS and the National Association of College and University Business Officers (NACUBO).

Uses of and Approaches to Cost Information

Cost Information in the Decisionmaking Process

Cost information and analysis have long been used in managing institutional affairs. The extent to which cost information is helpful in managing institutional affairs requires an understanding of the value the information may have in relation to other existing factors, for example, the quality of academic programs. The many factors affecting the usefulness of cost information and analysis can be described in terms of a continuum (Bacchetti 1977). At one end of the continuum, cost analysis is a primary factor in reaching a decision, as in the case of establishing room and board rates or in certain phases of the budget process, such as estimating the impact of inflation on programmatic objectives. In such cases, costs can be clearly identified and associated with a cost objective or service being provided, and prices can be established based primarily on cost. For example, the determination of room and board prices is based primarily on the cost to provide housing and food services.

At the other end of the continuum, analytic results may be merely indicative and therefore play a supplementary role because other important noneconomic variables or factors must be considered. Such instances may be determining student-faculty ratios or tenure policies, or setting course-load requirements. Cost information cannot measure what impact a change such as an increase in the student-faculty ratio may have on the quality of

instruction. The interrelationships of joint products (instruction, research, and public service) also create difficulties in measuring what impact a change in one activity has on another, such as the impact a decrease in government-sponsored research may have on the graduate instruction program.

Decisions in these areas, unlike setting room and board rates, have major impact on the mission of the institution and on its academic goals, so consideration must be given to factors other than costs, such as content and objectives of the academic program, effect on the faculty, and impact on the educational environment. Therefore, the importance of cost information must be weighed in relation to the nonfinancial factors when the subject under study affects the mission of the institution and its academic goals.

The variation in the relative importance of cost information is caused, in part, by the problem of associating costs with the outputs or benefits of higher education. For example, it is practical and feasible to determine the quality of housing provided to students; consequently, a fair and rational price can normally be determined. But an estimate of the benefits from taking a course or earning a degree relies on subjective judgment, which varies depending on one's perspective. In 1975, NACUBO published the paper "Fundamental Considerations for Determining Cost Information in Higher Education" [appendix B] which codifies the principles for determining cost information in higher education:

> In commercial organizations, cost generally can be assigned to well-defined and measurable products or services. In higher education, however, the services of instruction, research, and public service may not be measurable or separable in terms of units of output. For example, the instructional process produces an output sometimes referred to as an acquired body of knowledge; however, there is no concensus on how to measure the acquired knowledge as an output. Full-time-equivalent students, student credit hours, student contact hours, student headcount, student major by level, and degrees awarded are examples of costing units of service used to measure the instructional process in lieu of output measures. These units are not measures of quality or efficiency. [P. 4]

Because there is no consensus on how to measure acquired knowledge, cost analysts have turned to measuring the cost of the process that provides the *opportunity* to acquire knowledge. For example, institutional administrators may wish to compare the relative cost of providing various student programs at varying levels of instruction. The calculated costs will *not* take into consideration the value or quality of knowledge passed from professor to student; therefore, no answer is provided as to which student program

utilized resources most efficiently. However, *the comparison of costs does provide the challenge to examine, diagnose, and evaluate why the costs are what they are.* Unit costs of the educational process, combined with other programmatic information, provide administrators with the type of information they can use when deciding feasible and financially sound academic-program objectives.

CHOOSING THE APPROPRIATE COSTING APPROACH

Realizing that the usefulness of cost information and analysis varies with the subject matter under study, the cost analyst further has to choose the appropriate costing approach or technique to apply. There are several different approaches to determining costs of educational processes; the selection of the appropriate approach is based on the purpose for which the information is to be used. Three common types of cost approaches useful in higher education are referred to as full costing, variable costing, and standard costing.

FULL COSTING

Full costing is defined as the accumulation of all direct and all indirect costs attributed to units of service. The full-costing approach permits the user of cost information to examine the total cost of units of service as well as the direct and indirect components of cost that make up the full cost.

The full-costing approach requires that all direct costs and an appropriate share of indirect costs incurred by or for an organizational unit (such as an academic department) be included as the cost of units of service. These would include costs of such activities as the president's office and operation and maintenance of plant, which are not readily identifiable with the units of service being costed. Though the normal procedure under this approach is first to assign all direct costs to the units of service and then to allocate an appropriate amount for indirect costs, there are many instances where only the direct-cost portion of full costs need be analyzed.

The full-costing approach is frequently used in higher education, though often carried out only to the direct-cost level. Use of the full-costing technique is exemplified in guidelines established by the federal government for determination of indirect costs reimbursable under sponsored projects, though the regulations modify the full-costing approach by defining costs that are allowable and unallowable for reimbursement. The NCHEMS-developed *Procedures for Determining Historical Full Costs* also uses the full-costing approach.

VARIABLE COSTING

The variable-costing approach recognizes (1) those costs that are variable, that is, costs that change when changes occur in service volume or mix and (2) those costs that remain constant regardless of the number of units of service provided, which are referred to as fixed costs.[1] While the full-costing approach encompasses the assignment of all costs regardless of their variability to the units of service provided, variable costing distinguishes between those costs that vary with volume or mix and those that remain fixed. Variable costs include those direct and indirect costs that vary with the number of units of service produced within a given range of activity.

Variable costing is being used increasingly by educational institutions; it has long been used effectively for planning in the commercial sector. Commercial enterprises use the variable-costing approach in such applications as determining optimal distribution between capital and labor in the production process, examining optimal production volumes, and evaluating the optimal mix of products to be manufactured.

For educational institutions and not-for-profit organizations in general, the variable-costing approach is more useful in gaining an understanding of how costs (and revenues) may vary as volume (student enrollment, computer usage, square footage) changes, or institutional policies such as tenure, financial-aid support, and fund-raising strategies are altered. The variable-costing approach asks "what if" types of questions, such as "What if freshman enrollment changes by 10 percent?" This kind of question is often asked when administrators are involved in planning the appropriate courses of action for allocating future resources.

STANDARD COSTING

The standard-costing approach uses predetermined unit costs, which are compared with actual costs to identify variances. For example, in analyzing operation and maintenance of plant, variances from standard costs assist in focusing attention on variations from plan or budget and in determining corrective action to be taken. Standard costing is also useful in preparing plans and budgets for both management and those performing the work.

Standard costing is presently used to only a limited extent in higher education. Long used by commercial enterprises as a method of evaluating control over production processes, standard costing has been used in higher education primarily to establish prices for goods and services transferred from one organizational unit of an institution to another. Examples

1. Variable costing is a broad term and includes other costing techniques referred to as marginal costing and incremental costing. See Daniel D. Robinson et al., "Cost Behavior Analysis for Planning in Higher Education," *NACUBO Professional File* 9 (May 1977): 1-49.

are such items as computer services, physical-plant operation and maintenance, and patient-care services, where costs can be assigned to a discrete task being performed. The rates or prices calculated on a standard-costing approach can be compared with the actual costs incurred, and major differences (variances) can be isolated and examined to determine how efficiently the goods or services are being used.

The standard-costing approach has not generally been used for analyzing the costs of instruction, research, and public service. It requires an assumption that the educational process is provided in a fairly standard format, with little variance from a predefined understanding of the mix of resources (level and number of faculty, classroom or laboratory size, computer usage) used in providing instruction or conducting research. Such standardization may have little applicability to the educational process of most institutions.

SUMMARY

The three costing approaches described have application for specific types of decisionmaking situations. Because the NCHEMS costing procedures are an example of the full-costing approach, they are useful for certain types of analyses, but not for others.

To repeat earlier comments, there are no perfect solutions to most costing questions. However, the development efforts that have marked the evolution of costing techniques—in higher education and elsewhere—can be expected to continue with a resulting increase in the usefulness of such techniques to higher-education administrators, and full costing will continue to have a significant place in cost-analysis activities.

USES OF COSTING FOR INTERNAL MANAGEMENT

This section identifies the role of the costing approaches as they apply to the various functions of internal management. Costing can be useful in carrying out the internal-management functions of planning, budgeting, controlling, and evaluating.

PLANNING

The planning process involves the formulation of programmatic goals, an examination of alternative methods and costs to meet those goals, the selection of alternatives that produce the most effective utilization of available resources, and the exploration of ways to increase available resources. The process of selecting among alternative courses of action

requires an understanding of the effect on resource requirements of each alternative. If, for example, an institution is considering a change in course requirements for an undergraduate-degree program, it has to consider the cost impact due to possible changes in class size, faculty, physical space, and support services.

Variable costing—that is, estimating changes in costs due to varying activity levels and/or differing resource requirements—can provide relevant information in the process of selecting alternatives. In addition, historical-cost information derived from the *full-costing* and *standard-costing* approaches provides a valuable perspective on how institutional resources have previously been allocated. Such a historical perspective provides a frame of reference for the planning process.

BUDGETING

Budgeting is the process of allocating resources (usually for a one-year period) to responsibility centers, which in most instances are organizational units. Similar to the planning process, budgeting involves the examination of alternative courses of action and their effect on the distribution and use of resources.

For certain types of decisions, deans and department heads will find useful an understanding how changes in such items as numbers of students, course requirements, and student-faculty ratios affect resource requirements. *Variable costing* provides the relevant information for these types of issues.

The budgeting process involves the establishment of pricing for such items as room and board, and pricing for institutional services such as computing, physical plant, and utilities. The calculation of prices relies to a large extent on a determination of historical and projected unit costs derived from the use of either the *full-costing* or *standard-costing* approach.

CONTROLLING

The process of controlling the expenditures of resources involves the accumulation of expenditures by organizational unit and type of expenditures by organizational unit and type of expenditures (salary, travel, and so forth). Organizational units have the responsibility to use their resources as originally budgeted and to understand why differences from the budget may exist. The appropriate costing approach for establishing control depends on the way the responsibility center's budget has been constructed.

EVALUATING

The process of evaluation is a historical examination of how effectively the institution's resources are being used in relation to its academic goals and mission. In the evaluation process, each of the three costing approaches can provide useful information. When appropriate, the *standard-costing* approach can be used to determine how actual costs compare with a predetermined standard, and the causes of substantial variances can then be analyzed. The *variable-costing* approach is useful in those instances where projections may have been developed on the basis of volume or level of activity. In most instances, historical-cost analysis, by either the *full-costing* approach or the examination of direct costs, can be used to compare actual expenses to the approved organizational unit or project budget.

Critical to the evaluation process is an understanding of how and where the institution's resources are being utilized. Generally, it is helpful to understand the distribution of costs among academic program areas (by class level, discipline, student-degree program) and to specific support areas (student services, institutional support, libraries, and so on). Comparisons such as unit costs of instruction and faculty activity by academic program can assist in the review and evaluation process and, in conjunction with other data, can assist in determining how effectively the institution's resources are being used.

SUMMARY

The varied uses of the costing approaches can be somewhat confusing unless there is a clear understanding of the ultimate use of the information. Each approach has its own set of end objectives for classifying costs and, if matched to the requirements of the subject matter being discussed, can provide meaningful information. In the particular instance of the NCHEMS-developed *Procedures for Determining Historical Full Costs*, the cost information derived can be useful for gaining a historical perspective of how resources have been allocated to student programs and disciplines. Such data are useful as background material when planning for the allocation of future resources as well as when evaluating the allocation of past references.

COST INFORMATION FOR INTERINSTITUTIONAL COMPARISON

The process of developing cost information for interinstitutional exchange is difficult and complex. However, there are often instances when it is

important to understand how the costs of one institution compare with those of others. Such comparative information is useful for institutional decisionmakers who are planning and evaluating the allocation of their institution's resources. When one institution's costs are compared with those of others, there must be an understanding of the differences affecting comparability among the institutions. These differences can be classified as *methodological* and *functional*. When comparing cost information, it is necessary to attempt to eliminate the methodological cost-determination differences so that only functional differences remain to be evaluated.

METHODOLOGICAL DIFFERENCES

Methodological differences result from costing procedures that vary from institution to institution. Typical examples of methodological differences are the following:

1. The judgments exercised in collecting, estimating, and allocating cost differ, since they often depend on the interpretation of complex situations and on the unique characteristics of individual institutions. For instance, experience has indicated that there are *no* generally accepted bases suitable for *all* allocations of indirect cost. The preferred base will vary, depending on the institution's organizational structure and operating policies.
2. The definition of direct and indirect cost can be different from institution to institution because of management's ability to identify costs as direct or because decisions made by management influence how direct costs are defined.
3. The methods or procedures used to accumulate and analyze costs may differ from institution to institution, especially in the case of assessing and assigning costs to faculty effort.

FUNCTIONAL DIFFERENCES

Functional differences principally result from differences in academic programs and related support activities. Identifying the functional differences among institutions requires an analysis of the characteristics and content of programs and activities being compared. The following examples of functional differences are reasons why one institution's costs may vary from another's:

1. Missions, goals, and objectives differ among institutions
2. Quality, effectiveness, and delivery of the educational process differ
3. Organizational structure, activities, and units of service costed differ

4. Constituents served by institutions have different needs and therefore require different services and support
5. Different geographical locations of institutions cause costs for similar items to vary
6. Distinct differences exist between those institutions that are well established and those that are developing
7. Economies of scale may vary
8. Variations in costs occur because of differences in availability of revenues for funding programs

PURPOSE OF COMPARISON

Comparability is a relative concept that considers the extent to which units being analyzed are similar or dissimilar. Comparability, then, is contingent on the kinds of questions being asked and the type of comparative analysis being performed. It is possible that comparisons of two similar programs on dissimilar campuses would be appropriate for the purpose of understanding the significant differences between the two programs. It should be recognized that perfect consistency is impossible; the goal should be to have sufficient consistency, in order to produce data that are accurate within acceptable limits.

When comparing cost data between or among two or more institutions, it is important to prepare a detailed description of the programs being compared. Areas of concern include the goals of the particular academic unit teaching the discipline or offering the degree program; for example, quality of objectives, areas of specialization, degree requirements, and interdisciplinary relations. *The program description should always accompany the cost data in any type of cost exchange. If programs differ significantly in scope and objective, cost comparisons will serve no meaningful purpose.*

USES OF *PROCEDURES FOR DETERMINING HISTORICAL FULL COSTS*

The *Procedures for Determining Historical Full Costs* developed by NCHEMS calculate the average-direct, indirect, and full costs for instructional disciplines and student programs. The average cost per unit can be calculated in terms of full costs or only at the direct-cost level. As mentioned previously, for many institutions, the costing component of IEP can generate historical-cost information, which will provide a valuable perspective on the past allocation and use of institutional resources. However, it is not the intent, nor was the IEP costing component developed to replace other costing methodologies, such as those required by federal

government agencies, to calculate indirect costs reimbursable under grants and contracts. Also, there may be instances when specialized, ad-hoc cost studies would be more economical than establishing a continuous, ongoing cost-analysis system.

A number of institutions have incorporated earlier versions of the IEP costing procedures into their evaluation process and have found the resulting information helpful in understanding the cost structure of their disciplines and student programs. In the NCHEMS report *Profiles of Management Information Uses,* 12 institutions highlighted how historical-unit-costs data were helpful in evaluating the allocation of resources. Typical examples were:

1. A community college analyzed and compared its unit costs in disciplines and degree programs with eight similar community colleges that developed cost figures using standard NCHEMS definitions and procedures. The college found that while its unit costs in some degree programs, such as accounting and physical science, were similar to those in the other eight institutions, several programs, including architectural technology and chemical technology, were considerably more expensive than those at the other campuses. Each exceptional case was analyzed, and in some cases the other campuses were contacted to ascertain why the variance in unit costs existed. As a result of comparing cost information, the institution has a better understanding of why its costs vary from those of the other institutions.
2. Based on unit-cost information and faculty-activity analyses derived from the use of IEP, a small, private college was able to make a number of decisions that strengthened the financial viability of the institution. The greatest change due to availability of new kinds of management information occurred at the department level. Faculty members found that unit-cost data and comparative information gave new clarity and focus to their planning and management decisions and allowed them to better understand the implications of their decisions.
3. A state university used unit-cost data and faculty-activity analysis to gain a better understanding of the appropriate support level for its social-science programs. Academic administrators had been concerned that their undergraduate social-science-discipline costs were low compared to other disciplines in the university. Cost-data comparisons with three other institutions showed that the disparity between social sciences and other disciplines was similar at all institutions. Thus the institution determined that undergraduate social sciences are consistently low-cost disciplines and perhaps

should not be compared to dissimilar disciplines on a single campus.

MODIFICATION OF PROCEDURES FOR SPECIFIC INSTITUTIONAL USE

Ideally, the validity of comparisons using the IEP costing procedures relies on strict adherence to uniform definitions, procedures, and conventions. However, institutional realities are such that completely comparable data are rarely available. Chapter 2 describes the procedural judgments that must be made, and as a result of making those judgments, comparability will necessarily be compromised.

The procedures described in chapter 2 emphasize the need for uniform definitions and procedures but offer alternatives in certain instances. For example, three options are described for distributing faculty effort. Institutions exchanging cost information should decide on one of the three alternatives, because the methods may not produce comparable results.

When an institution is using the NCHEMS costing guidelines with the intent of analyzing its own costs rather than for exchange purposes, the institution should use definitions and allocation methods that are consistent with its organizational structure, accounting system, and purpose of the study. For example, for comparison purposes, the IEP costing procedures state that expenses of a central administrative office, as in statewide systems, should be included in the full costs of an institution. This costing guideline need not be followed if an institution is performing a cost study for internal purposes and not for exchange purposes.

A similar modification in the procedures is appropriate for cost information exchanged among institutions within a state or any other group of institutions that wish to compare cost data. The procedures and definitions described in chapter 2 should be modified to best achieve the purpose of the study.

There are also instances when institutions comparing cost information have found it difficult to conform to the recommended costing guidelines. Testing of the costing procedures has made it possible for NCHEMS staff to identify several reasons why institutions vary from the procedures, thus affecting comparability. These reasons are listed below, with the intent of aiding users to recognize potential problem areas.

1. An institution's operational data system cannot easily provide the required data, and the manual data-collection effort to "adjust" the data would be too great to justify
2. Occasionally, variations from the recommended procedures are necessary to increase the validity of the cost determination due to

better knowledge of the resource-use patterns for the institution

3. The procedures conflict with internal planning and management data
4. For some institutions, the definitions and procedures may be too complex; others may find them too simplistic for their purposes

The management of an institution should understand how these deviations from the costing guidelines affect the ultimate purpose of the cost information. Each institution or group of institutions needs to examine carefully the costing guidelines and to decide on the set of definitions and procedures that are best for its situation. The definitions and procedures that have been recommended are based on the costing standards established by NACUBO for institutions of higher education. *However, the critical factor involved in a cost study, particularly for exchange purposes, is that the methodology be consistent and an explanation or analysis be given of why costs vary among the programs and institutions participating in the study, including recognition of the functional differences of the institutions.*

APPENDIX B

Fundamental Considerations for Determining Cost Information in Higher Education

This material, written for both the cost analyst and nonfinancial decision-maker, is reprinted from *College and University Business Administration* with the permission of the publisher, the National Association of College and University Business Officers.

Fundamental Considerations for Determining Cost Information in Higher Education

FOR MANY YEARS cost information and cost analysis have been recognized by administrators in higher education as useful tools in managing the internal affairs of their institutions. More recently, federal, state, and other funding and policy-setting bodies have indicated additional needs for cost information, especially in the process of appropriating and granting funds to higher education.

For cost information to be useful, it is essential that the fundamentals for determining and using costs be understood. Heretofore, these fundamentals have not been compiled as a basis for developing cost information in higher education.

In formulating fundamental considerations for the development and use of costs, higher education has available the existing body of knowledge already developed, tested, and proven in areas other than higher education. After appropriate modifications, such cost fundamentals are helpful in identifying how cost can be determined and applied by institutions of higher education. However, in applying such fundamentals, consideration should be given to the particular characteristics and objectives of these institutions.

The determination of cost information is a process of approximation, and requires the individual performing cost determinations to exercise judgment based on circumstances relevant to the purposes for which cost information is collected. Different cost results occur even when equally valid alternative approaches are used. Determination of the approach is often based on practicability, as long as the results are valid and meaningful for the purposes intended.

There have been attempts to use a single methodology for determining cost to satisfy a wide variety of purposes for which cost information is used. This chapter indicates the need for different cost determination methods and approaches to satisfy the variety of purposes for determining cost rather than using a single method for all purposes. It describes the available methods, approaches, and related considerations for determining costs.

In order to place in perspective the various aspects of costing described in the sections that follow, it is well to visualize the complete costing process. The term "costing" is used here to denote the cost determination process. The essential factors involved in determining costs in higher education and their interrelationships are shown in the exhibit on the following page.

Foremost among these factors are costing standards to be applied in determining cost; they serve as the foundation on which costing is performed. Before costing can begin, however, it is necessary that the purposes of cost information be clearly identified. Once the purposes are defined, then the definitions of cost, the cost objectives and costing units, the types and classifications of cost, and the financial accounting and statistical data to be used to provide the desired cost information can be specified.

At this stage the appropriate cost determination methodology should be formulated. The methodology can be either the specific service method (job order method), the continuous service method (process method), or a combination of the two methods. These methods are described in detail in the section "Cost Determina-

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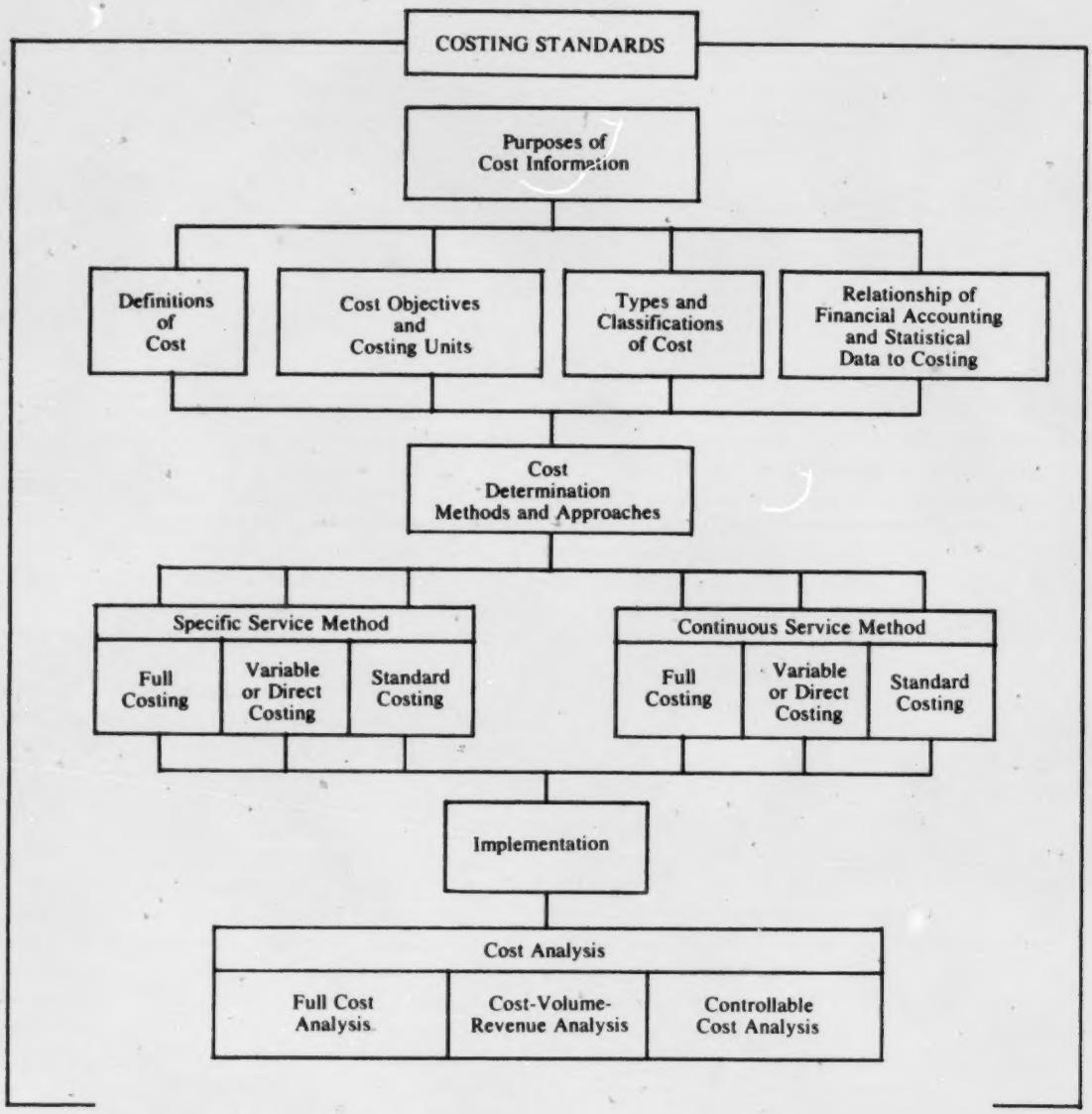

tion Methods and Approaches." Within these methods full costing, variable or direct costing, or standard costing approaches can be employed. Based on the methodology selected, costing procedures are implemented. The resultant cost information serves as the subject of cost analysis, which is the process of examining cost and statistical information and deriving meaning to satisfy the needs of users. The three basic cost analysis categories are full cost analysis, cost-volume-revenue analysis, and controllable cost analysis.

PURPOSES OF COST INFORMATION

There are many purposes for determining cost information to satisfy both internal and external requirements. It is essential that the purpose of obtaining cost information be identified at the outset in order that appropriate definitions and methods of costing can be selected.

For a college or university, cost information is used for purposes of assisting in planning and budgeting, in controlling, and in evaluating performance. The process of planning and budgeting is designed to formulate the approach to be followed by an institution in achieving its long-term mission and shorter-term goals and objectives. In the planning and budgeting process, cost information is one factor used in examining alternatives, determining the cost requirements of each alternative, and selecting those alternatives consistent with the most effective utilization of available resources. Cost information may be used in modifying the budget plan during the operating period by indicating the cost consequences of proposed actions in view of changes in priorities, economic conditions, and other circumstances that could not have been foreseen during the planning and budget process.

In controlling current operations, cost information is a valuable indicator for identifying areas in which current budgetary adjustments may be required or corrective actions needed. The control process involves the comparison of incurred cost to budgeted cost. Variances identified in the control process are examined to determine the appropriate action to be taken.

Cost information is one among many important aspects in the evaluation of performance. Evaluation involves an after-the-fact examination of results and assists in determining whether the educational and related activities conducted were as effective as anticipated and whether institutional resources were appropriate to support these activities. By comparing the results of operations to the original plan, areas can be identified in which adjustments may be needed in future planning and budgeting. Cost information also is used in determining interdepartmental charges in the financial accounting system.

Cost information is used by federal, state, and local bodies responsible for appropriating public funds. Foundations and other granting bodies also are interested in cost information. Through the years, these granting bodies have been interested in cost information (and other information) to assist them in determining whether they will use their funds to support a need. This information also has been used by granting bodies to reimburse direct and indirect costs related to grants and contracts for specific programs. Certain governmental and private funding agencies have established required costing procedures for reimbursement purposes.

COSTING TERMS

For the purpose of determining cost information, it is necessary to establish definitions of cost and their relationship to cost objectives and costing units.

Definitions of Cost

The term "cost" is defined in different ways, depending on the objectives for which costs are determined. Three commonly used definitions of cost are derived from financial accounting, cost accounting, and economics.

Financial accounting is concerned with recording, classifying, summarizing, and analyzing financial data. The financial accounting definition treats cost as the amount or equivalent paid or charged for something of value. In this sense, cost represents the total value sacrificed to obtain assets and to receive goods and services. Another term very much a part of the cost concept is "expense." For financial accounting purposes, expense is the expired portion of cost applicable to a specific period. Therefore, the cost of acquired assets that benefit future periods, such as inventories and capital assets, is not considered an expense at the time of acquisition, but is deferred until the assets are used. The term "expense" should not be confused with the term "expenditure." Expenditures include all expenses except depreciation and also include the acquisition cost of capital assets.

Cost accounting is concerned with accumulating, classifying, summarizing, interpreting, and reporting the cost of personnel, goods and services, and other expenses incurred to determine unit costs. Expenses incurred during a specified period, as defined by financial accounting, are the prime ingredient of cost accounting for cost determination purposes. The costing process is designed to assign or allocate costs to particular units of service provided. The costs derived may be actual costs or may be other costs such as replacement, projected, or imputed costs. The primary difference between cost accounting and

financial accounting is that the former involves obtaining unit cost information and the latter involves obtaining costs primarily by organizational unit and function.

In economics, cost can be viewed from the "macro" or "micro" point of view. The macro definition of cost typically considers society as a whole rather than focusing attention on a particular institution. For example, the economist considers opportunities sacrificed by the community at large as societal costs external to the institution. On the other hand, the micro definition of cost used in economics focuses on the activities of an organization. This definition, in addition to considering expired cost (expense), may include other costs such as replacement, projected, or imputed costs. This latter definition is similar to that often used in cost accounting.

The definition of cost depends on the purposes for which cost information is to be used. There is no single definition of cost that will satisfy the variety of needs for cost information. Accordingly, significant differences in cost information will be derived, depending on the selection of cost definitions used for different purposes.

Cost Objectives and Costing Units

A cost objective is a defined entity to which cost is related, and can be an organizational unit, a project, responsibility center, function, program, or some other identifiable entity. Cost is accumulated and assigned to cost objectives for purposes of measuring the cost of processes or specific services. The cost objectives used in the costing process are based on the purposes for which cost information will be used and the level of cost aggregation desired. Different costs, and therefore different cost objectives, are required for different purposes.

Costing units are measures reflecting the activities or outputs of cost objectives, and bear a relationship to the incurrence of cost.

In commercial organizations, cost generally can be assigned to well-defined and measurable products or services. In higher education, however, the services of instruction, research, and public service may not be measurable or separable in terms of units of output. For example, the instructional process produces an output sometimes referred to as an acquired body of knowledge; however, there is no consensus on how to measure the acquired knowledge as an output. Full-time-equivalent students, student credit-hours, student contact-hours, student headcount, student major by level, and degrees awarded are examples of costing units of service used to measure the instructional process in lieu of output measures. These units are not measures of quality or efficiency.

Measurable units of output are available for certain support activities such as meals served in food service facilities, jobs run by computer centers, and pounds of steam produced by heating plants.

Types and Classifications of Cost

Depending on the intended use of cost information, one type of cost or a combination of types of cost may be employed. Five basic types of cost are:

1. Historical cost.
2. Projected cost.
3. Standard cost.
4. Replacement cost.
5. Imputed cost.

For certain cost determination purposes, components of the above types of cost may be classified as either direct or indirect. For other cost determination purposes, components may be classified as fixed, variable, or semivariable.

Historical Cost. Historical cost usually is expressed in terms of the monetary value of economic resources released to pay faculty and staff salaries, to acquire materials and services, and to utilize facilities. Historical cost results from an expenditure involving the disbursement of cash or incurrence of a liability.

The two methods of determining historical cost are referred to as the cash basis and the accrual basis. The cash basis of accounting recognizes revenues when cash is received and expenditures when cash is paid, whereas accrual accounting recognizes revenues when earned and expenditures when materials are used and services are performed. To provide valid and consistent historical cost information, college and university accounting standards, as promulgated by authoritative bodies, require that accounting records and resulting financial statements be based on the accrual method of accounting. For cost

determination purposes, the accrual basis should be used. In this regard, an important concept inherent in accounting and costing is materiality, which provides that it is not necessary to recognize certain items of expense and revenue if their omission does not have a significant effect on the final results.

Projected Cost. Projected cost for an educational institution is an estimate of the cost to be incurred in a future period. Changes anticipated in programs, student demand, faculty mix, faculty workload, support required, salary rates, and economic conditions all affect cost expectations. Projected cost is based on available knowledge about past activities, along with expectations of new and planned activities and the effect of changing conditions on cost.

Standard Cost. Standard cost is a predetermined cost, used as a target or basis of comparison with actual cost when units of service are provided. Establishment of standard cost involves a detailed examination of past occurrences and an evaluation of expectations to establish meaningful standards of performance. Standard costs may be developed by estimating costs based on historical experience or based on special studies.

Replacement Cost. Replacement cost refers to that cost which would be incurred at present or in the future to construct or acquire physical facilities or to purchase comparable services and materials to replace those obtained in the past. Replacement cost is not recorded as part of the financial accounting system. It may be used to measure the effects of inflation or deflation against the original cost incurred.

Cost viewed in terms of replacement highlights the fact that an institution is utilizing assets purchased in the past, which may be replaced at a cost different from historical cost. Because of changing price levels, recognition of historical cost alone may misrepresent the cost if replacement is considered. Therefore, since certain assets presumably will be replaced by an institution, replacement cost is measured at the current or future market level.

Imputed Cost. Imputed cost relates to potential resources that would have been available to an institution, but that were forgone because one alternative was chosen over another. Imputed cost does not consider the past, present, or eventual disbursement of cash or its equivalent, but rather is concerned with measuring the cost of alternative opportunities. By considering forgone resources as a cost, management is able to evaluate the imputed cost of one alternative versus another.

An example of imputed cost is the interest income forgone by an institution, which could have been earned if the funds utilized for a particular activity had been invested. This imputed cost represents economic resources forgone by an institution in selecting one alternative over another.

Direct Costs and Indirect Costs. For cost determination purposes, components of cost may be classified into direct costs and indirect costs. Direct costs are those expenses that are readily identifiable with a cost objective. For example, where the chemistry department is the cost objective, identifiable faculty compensation and supplies associated with teaching chemistry courses are direct costs of the department.

Indirect costs are those costs not readily identifiable with a cost objective. Indirect costs of a chemistry department include an allocated portion of the expenses of the president's office, libraries, and operation and maintenance of plant. These costs are incurred for more than one cost objective and are not readily related in a direct fashion to each cost objective.

The distinction between direct and indirect cost has to be judgmental in many cases. A major factor in distinguishing between direct and indirect cost is the level of aggregation of the cost objective. For instance, a portion of the compensation paid to a chemistry department chairman may be considered an indirect cost of a chemistry course. However, if the cost objective is the chemistry department as a whole, instead of the individual courses conducted by the department, the cost of the department chairman is direct.

The determination of whether cost is direct or indirect also is affected by the practicality of assigning costs directly to the cost objective to achieve greater precision. In many situations, much effort is required to relate cost directly to the cost objective, with the results not being materially different from the identification of cost as indirect. Therefore, an important factor for

consideration in the assignment of costs is the added expense of identifying costs as direct rather than indirect. The expense of making a precise assignment of costs as direct must be weighed against the precision required in satisfying the purpose for which cost information is used.

Other factors affecting the distinction between direct and indirect cost include the individual judgments that must be exercised in classifying costs and the differences among institutions, such as organizational structure and operating policies.

Fixed, Variable, and Semivariable Costs. Components of cost also may be identified as being fixed, variable, or semivariable (also referred to as mixed or step-variable) costs. Total variable costs fluctuate in direct proportion to the volume of units of service provided. Total fixed costs, on the other hand, remain constant over a period regardless of the number of units of service provided. Semivariable costs include both fixed and variable elements, the fixed portion relating to capacity and the variable portion depending on usage. These semivariable costs typically react to volume changes in an irregular fashion; thus, cost that is fixed for a certain range of units of service becomes variable as that range is exceeded.

Certain costs are classified as fixed because of policy decisions of an institution, and may be further referred to as committed or discretionary. Committed fixed costs are those that must be expended because of existing contractual arrangements, plant facilities, and other activities that are necessary to maintain a viable program within the institution. For example, faculty compensation may be a committed cost because of employment contracts. Discretionary fixed costs (also referred to as managed costs) result directly from policy decisions of management. An example of discretionary cost is preventive maintenance. The incurrence of such costs has no relationship to volume of service, but because of their nature, may be adjusted within a particular costing period.

COSTING AND FINANCIAL ACCOUNTING

In the determination of cost information, there are important relationships between financial accounting and cost accounting that need to be recognized. A financial accounting system is used by all colleges and universities to provide information to administrators, governing boards, and others. The information obtained from this system, however, often cannot completely satisfy the needs for unit cost information. For specific purposes, cost information may be developed by conducting special cost studies, which typically utilize data contained in established financial accounting systems as well as financial and statistical data available from other sources. To meet the repetitive requirements for certain cost information, an institution may expand its financial accounting system or develop supplemental costing procedures. The distinguishing characteristic of cost accounting is the introduction of statistical data to determine unit costs.

A financial accounting system in higher education is based on generally accepted accounting principles and is designed to satisfy the institution's need for recording, collecting, classifying, and reporting financial information. This involves maintaining separate accounts in the financial accounting system for (1) the unrestricted and restricted funds received and expended by the institution; (2) the organizational entities within the institution responsible for expending funds according to budgets; and (3) the objects of expenditures incurred, such as salaries and wages, supplies, and equipment. The classification of different accounts is in accordance with the institution's chart of accounts. Except for the broad classifications of financial accounting information promulgated by authoritative bodies for external financial reporting purposes, the chart of accounts usually varies among institutions. The variations are due in part to differences in institutional characteristics and information requests.

Because a chart of accounts is designed to serve specific purposes, the information obtained from the financial accounting system usually does not satisfy the variety of needs for cost information. Expenditures such as interest on plant indebtedness recorded in certain fund groups for financial accounting purposes may have to be combined with expenditures of other fund groups for cost determination purposes. Furthermore, there are instances where the fi-

nancial accounting system does not include certain costs such as retirement plan expense recorded by a state agency and depreciation expense, which is not required to be recognized by institutions of higher education.

Accounts in the financial accounting system may or may not coincide with cost objectives. In determining cost information, certain accounts in the financial accounting system may require analysis to identify their direct or indirect relationship to a cost objective or to identify their fixed, variable, or semivariable nature. Financial accounting information which cannot be directly identified with a cost objective may need to be allocated as an indirect cost. Similarly, the methods used to charge personnel costs to accounts for financial accounting purposes may not be sufficient bases for identifying costs to a cost objective for cost accounting purposes.

Reconciliation, the process of identifying and giving appropriate consideration to differences in two or more sets of data, should be made between cost information and official financial and statistical information. This reconciliation is necessary because cost accounting systems or special cost studies normally make some use of the following:

1. Costs appearing in different form from that contained in the financial accounting system.
2. Costs unavailable in the financial accounting system.
3. Statistical data available elsewhere in the institution or from other sources.

The reconciliation of these items is necessary to insure the validity of cost information.

As is true with the presentation of a financial statement, cost information reports should be accompanied by a disclosure statement sufficient to provide the reader with the significant costing standards and policies affecting the determination of the cost information for its intended purpose.

COST DETERMINATION METHODS AND APPROACHES

Cost objectives may represent either (1) specific, unique projects or (2) processes producing similar, repetitive services. The costs of such objectives are determined by one or a combination of two methods, namely, the specific service method or the continuous service method. Generally, under the specific service method, costs are accumulated to a specific service or project, while under the continuous service method they are accumulated to a group of similar units of service. In commercial organizations, these methods are referred to as job order and process costing, respectively. Selection of the appropriate costing method is essential if valid costs are to be determined. The continuous service method costs all units at an average as though the units were all uniform. If the services are unique and not uniform, use of the continuous service method would give invalid results.

Associated with these primary methods are three cost approaches, namely, full costing, variable costing, and standard costing, which can be used with both the specific service and continuous service methods.

Specific Service and Continuous Service Methods

Presented below are the characteristics and uses of each primary method, followed by a description of its applicability to institutions of higher education.

Specific Service Method. As the name implies, this cost determination method is used to collect cost incurred for a specific service, which can be identified separately. It is because each unit is unique that cost must be segregated, rather than being identified as part of a continuous process, wherein an average cost can be derived that is representative of each unit of service. In the specific service method, the costs of different units of service are accumulated individually throughout the period during which service is provided. As a result, costs are compiled by each project or job in each organizational unit.

Examples of specific services are research projects, jobs in print shops, and usage of motor vehicles. Each project or job has unique objectives requiring different amounts of personnel effort, goods and services, and other expenses to achieve the result intended when the project was conceived. For this reason the specific service method is used, which identifies costs of each project.

Continuous Service Method. The continuous

service method is useful when the activities being costed consist of similar units of service. In this instance, the service being costed represents a number of uniform units the cost of which can be aggregated to arrive at an average cost per unit for a particular period. Service may be provided by a number of separate organizational units performing standard activities. Costs may be accumulated through various processes or organizational units until all services are completed.

The method for attributing cost under the continuous service method is comparable to the specific service method in that the cost resulting from expenditures or requisitions of supplies is determined on somewhat the same basis. A difference that does exist, however, is that the cost incurred is accumulated by process or organizational entity rather than by individual project.

An example of the use of the continuous service method is a department such as history, providing instructional services to majors in that discipline. Typically, the department also simultaneously provides instructional services to majors of other disciplines such as English and chemistry. Instructional services provided to these different majors are the same when they attend the same courses. Essentially, courses are designed to provide instructional services to students, according to a defined curriculum. Because of these characteristics, a continuous service cost method may be applied to determine a cost per unit of service provided to each student.

Selection of Method. As a general rule, the following guidelines may be employed to select the method to attribute cost:

1. Cost incurred by an organizational unit to provide a uniform service for a particular period should be accumulated as a single cost objective by the continuous service method.
2. Cost incurred by an organizational unit to provide more than one uniform service for a particular period should be accumulated as more than one cost objective by the continuous service method.
3. Cost incurred by an organizational unit with different services that can be separately identified should be accumulated by the specific service method.
4. Cost incurred by an organizational unit to provide one or more uniform services and one or more different services can be accumulated concurrently or in sequence by both the continuous service method and specific service method, respectively.

Cost Approaches

Full, variable, and standard costing, as previously indicated, are approaches to cost determination that are used in conjunction with either of the primary methods discussed previously. Selection of the cost approach is determined by the purpose for which cost information is to be used.

Full Costing. Full costing is defined as the accumulation of all direct and all indirect costs attributed to units of service. The full costing approach permits the user of cost information to examine the total cost of units of service as well as direct and indirect components of cost that make up the full cost. The full costing approach requires that all direct costs and an appropriate share of indirect costs incurred by an organizational unit (such as an academic department) be included as the cost of units of service. Other indirect costs incurred by the institution also must be considered when determining full cost. These include indirect support activity costs, such as the cost of the president's office and operation and maintenance of plant, which cannot be attributed directly to the units of service being costed.

Full costs also include depreciation expense. Depreciation expense is that portion of the cost of limited-life capital assets (buildings and equipment) which expires during a period. In higher education, financial accounting standards do not require recognition of depreciation; however, if an institution chooses to determine full costs, provision should be made for depreciation expense. There are instances when an institution, in accordance with its costing purposes, may desire to exclude expired capital costs, but the results would not represent full costs.

Full costs also should include direct benefits of a material nature provided by an outside organization, such as pension expense incurred by a state, but not recorded in an institution's financial records.

In colleges and universities, information derived from the full costing approach may be used to compare and examine periodically the cost and revenue per unit of service provided. Full cost information may assist in (1) determining whether tuition, fees, appropriation requests, and revenues from other sources warrant adjustment and (2) evaluating whether funds expended produced the benefits anticipated. Full-cost procedures should be used for cost determination of sponsored projects.

Variable Costing. Variable costing recognizes as the cost of services provided only those costs which are variable, that is, those costs which change when changes occur in service volume or mix. Costs that remain constant, regardless of the number of units of service provided, are referred to as fixed costs.

Full costing encompasses the assignment of all costs, regardless of their variability to the units of service provided, whereas variable costing assigns only those costs that vary with volume or mix. Variable costs include those direct and indirect costs that vary with the number of units of service provided or within a range of activity.

In using the variable costing approach, costs incurred by an organizational unit are classified as either fixed or variable. For instance, if a program were to be added or eliminated, it would be necessary to determine how the costs of faculty salaries, departmental administrative salaries, and supplies would vary as a result of an increasing or decreasing number of units of service to be provided. Aggregate faculty salary cost may increase because additional sections may be required for a new program. If a program is eliminated, faculty cost may or may not decrease, depending on tenure conditions and on existing contractual obligations to nontenured faculty members. In the case of departmental administration, salary cost may be fixed because an anticipated increase or decrease in units of service may not require a change in administrative effort. On the other hand, cost of supplies may vary depending on the number of units of service. Determining the expected variability of these elements of cost is important in examining the financial implications of decisions being considered.

Variable costing is of particular import to an institution when the typical "what if" questions are asked. For instance, the financial impact of different alternatives under consideration might involve the following questions:

1. What if an academic program is expanded or contracted?
2. What if faculty salaries are raised?
3. What if average class size is increased or decreased?
4. What if the number of chemistry and history courses are reduced, with a corresponding increase in the number of English courses?
5. What if enrollments increase or decrease?

Standard Costing. Standard costing uses predetermined unit costs, which are compared with actual unit costs to identify variances. For example, in analyzing operation and maintenance of plant, variances from standard costs assist in focusing attention on variations from plan or budget and in determining corrective action to be taken. Standard costing is also useful in preparing plans and budgets for both management and those performing the work.

INDIRECT COST ALLOCATION

This section describes the considerations involved when indirect costs are to be allocated to cost objectives.

Indirect Cost Pools

Indirect cost pools are established for the purpose of allocating costs on a common allocation basis to a group of cost objectives benefiting from or causing the incurrence of the indirect cost. Indirect costs may be aggregated into pools by (1) organizational unit or cost center; (2) expenditure object, such as fuel and electricity; or (3) other categories. The number and composition of indirect cost pools relate to the characteristics of an individual institution. Factors used in determining indirect cost pool classifications include the purposes for which cost information is to be used, characteristics of the cost objectives being costed, complexity of the organization, and degree of accuracy needed.

Equitable Allocations

Cost accumulated in indirect cost pools should be allocated to cost objectives in an equitable

manner. An equitable allocation basis relates to the benefits received by the cost objective or to the activities of the cost objective that logically and reasonably caused the cost to occur.

Selection of Allocation Bases

The bases selected for allocating indirect costs should be quantitative measures that can be applied in a practical manner. Such measures may be total direct costs, direct salaries and wages, square feet of space occupied, population of students and/or faculty served, or others as appropriate for the particular cost pool being allocated. The measure selected can be developed as part of a system designed to collect statistical data throughout the period or as a result of a special study.

The measure selected for distributing indirect cost should be one that will result in the most equitable allocation of indirect cost to the cost objective within the realm of practicability. After considering the purpose of cost determination, the most equitable method may not be the most reasonable in terms of both time and cost involved in collecting and tabulating quantitative data. For this reason the most practical cost distribution base should be employed, provided the result will not be materially different from a more complex alternative.

Common Cost

In processes in which two or more services are provided simultaneously, common costs occur in providing these services. In order to allocate equitably the common cost incurred in a single process to the services provided, a determination of the interrelationship between or among the two or more services involved in a given cost objective must be made. When the services are of similar importance, the process may be referred to as a joint service. Alternatively, when one service is incidental to the other, the process is one of primary-secondary service. This distinction and analysis should be made so that cost incurred in the process can be distributed equitably to the joint services or the primary-secondary services.

Joint Services. Joint services have one or more of the following characteristics:

1. The services are complementary in the sense that providing one results in providing the other.
2. The services are substitute in the sense that increasing one decreases the other.
3. The services are independent in the sense that there is no relationship between or among them except that it is less costly to provide them together rather than separately.

Allocation of cost to each of the joint services is based on a method that treats each service equitably by proportional distribution of cost. For instance, joint service cost may be allocated to the resulting services on the basis of units of each service.

One of the most difficult problems in determining joint service costs is the inseparable nature of many joint services. For example, the research function is an integral part of the instruction function, particularly at the graduate and professional levels. Medical schools have a very complex joint service problem arising from the inseparable nature of instruction, research, and patient care. In such situations, any separation of cost for joint services usually will be subjective.

Primary-Secondary Services. Primary services (main services) are the principal services of the process being costed. Secondary services (by-product services) are produced with a primary service and by the same process. The distinguishing characteristic of a secondary service is its minor importance in relation to the primary service.

Allocation of costs applicable to secondary services is handled in one of two basic ways.

1. No cost allocation is made to the secondary service, and revenue derived therefrom, if any, either is used to reduce the cost of primary service or is treated as other revenue, with no reduction in the cost of primary service.
2. Appropriate costs are allocated to the secondary service.

An example of primary-secondary services would be the academic services of a forestry school and the related forest products available for disposal. Such products are often sold to outside users, but are not a primary reason for the institution to have the forestry school. In this case, no cost would have to be allocated to the

secondary service, with earned revenue either used to reduce the cost of primary services or treated as other revenue. As an alternative, a portion of the total operating cost of the forestry school may be allocated to the secondary service.

COST ANALYSIS

Once the purposes of obtaining cost information have been identified and costs have been determined, cost analysis can be performed. The act of performing cost analysis involves the examination and evaluation of costs and related statistical information in order to determine the implications of past, present, and future actions. Although cost analysis can consider past and present actions alone, one of its major uses is that of providing cost information concerning alternative opportunities available and assisting in the selection of those alternatives considered appropriate.

In performing cost analysis in higher education, it may be important in certain cases to differentiate between expenditures financed from restricted funds and those financed from unrestricted funds. This distinction must often be considered when using cost information because restricted funds can be used only for specific purposes and can be terminated at a specific time or at the completion of an activity. Where these factors are of some significance to institutions having large amounts of sponsored projects or restricted grants, it may be useful for unrestricted and restricted costs to be separately identified throughout the cost determination process. For more information on restricted and unrestricted funds, refer to the chapter "Current Funds." (See Publisher's Note on page 19.)

While there are innumerable analyses that may be made of cost information, three basic categories of cost analysis are full cost analysis, cost-volume-revenue analysis, and controllable cost analysis. The particular category of cost analysis to be applied is a chief factor in the selection of one of three costing approaches—full, variable, and standard costing.

Full Cost Analysis

Full cost analysis involves the process of examining and evaluating the total cost attributable to a cost objective. This type of cost analysis may be useful in establishing funding and price structures in higher education for such items as tuition and fees, appropriation requests, and recovery of grant and contract costs. It also may be used in examining and evaluating the historical cost performance of activities and in cost benefit analysis. In utilizing full cost analysis, it is generally useful to consider the component parts of full costs.

It should be noted that the use of average cost per unit of service in full cost analysis is limited for projecting future costs because cost variations resulting from volume changes do not follow the average. More than likely, future average costs will indeed be different from the present level, as the mix changes and the number of units provided increases or decreases. When costs are to be used for projections, it is necessary to consider the fixed and variable nature of the cost components.

Cost-Volume-Revenue Analysis (Differential Analysis)

Cost-volume-revenue analysis involves the relationship among the cost of service, number of units of service provided, and revenue derived from providing such service. This type of analysis presents the financial results anticipated for particular levels of activities or alternatives being considered. Emphasis is placed on examining cost, volume, and revenue, which can be different for alternative activities and for varying levels of units of service provided. For instance, instructional cost in a college or university is affected by changes in student requirements, course offerings, section size, cost of goods and services purchased, and teaching loads. Revenue is affected by the number of students enrolled, tuition and fee rates, and other factors. Since all costs do not vary with volume, analysis is required to identify variable and fixed costs. The variable costing approach to cost determination described earlier is used to perform this type of analysis. Cost-volume-revenue analysis assists in determining the effect of alternatives on revenue and cost.

Differential cost-revenue analysis (often referred to as incremental analysis) is a type of cost-volume-revenue analysis that assists in mak-

ing choices among various volume alternatives. Differential costs and revenues are costs and revenues expected to change as a result of changes being considered in existing institutional activities. They are the summation of a series of marginal costs and revenues. Marginal cost and revenue refer to the change resulting from the addition of one unit of service.

Emphasis in differential analysis is directed toward examining those cost and revenue elements that will change and the changes in the amount of cost and revenue that will occur as a result of selecting one alternative over another. Similar useful analysis can be performed by relating changes in cost to changes in volume without reference to revenue changes.

Controllable Cost Analysis

Controllable cost analysis, which uses information normally derived from an institution's financial accounting records, involves the examination of those costs that are the assigned responsibility of the manager of an organizational entity. In institutions of higher education, as in other organizations, controllable costs are related to organizational entities so that accountability for the use of resources is identified with a manager.

In this analysis, actual costs are compared to projected (budgeted) or standard costs to determine variances. Analysis may indicate that variances were caused by the actions of a manager, and thus it may be determined that the manager should adjust subsequent expenditures to insure conformance to budgeted cost. Where variances resulted from circumstances beyond that manager's control, the causes may be attributed to: (1) volume changes, such as an increase or decrease from that planned in the number of students requiring room and board; (2) institutional policy decisions requiring a different level of service than originally intended; or (3) the environmental effect on cost, such as that experienced with rapidly changing utility rates. Variances caused by these factors may necessitate an adjustment in the manager's budgeted cost so as to establish a new level of controllable cost which the manager is responsible for achieving.

COSTING ISSUES

Cost data of various kinds are being used more than ever by colleges and universities for internal management purposes. Furthermore, external agencies, such as state legislatures and local government bodies, increasingly are turning to cost-based formulas to determine the level of funding to be provided to institutions. An important question for both internal and external parties is: How can more and improved cost information be provided in a way that will improve the decision-making process in higher education? Before this question can be answered conclusively, a considerable amount of research should be performed.

This section describes the more significant cost determination issues facing higher education. Some of these issues require extensive definition, testing, and validation of results before they can be resolved.

Quality and Efficiency

There is considerable interest in finding ways to appraise the quality of educational programs in higher education; however, there are no generally accepted measures of quality. Some factors that may affect the quality of educational programs have been identified as the academic ability of students, the effectiveness of faculty, the financial support for programs, and the availability of physical facilities. While there may be a relationship between cost and quality, it is not appropriate to measure quality by using cost information.

There is also interest in measuring the efficiency of educational programs; however, no acceptable measures are available. Some institutions attempt to use average class size data, student credit-hours-taught data, and classroom utilization data as measures of efficiency.

Judgment is often introduced as a substitute for quantifiable measures of quality and efficiency. Such judgment can be based on prior experiences, defined educational priorities, student and faculty demands, and other factors influencing decisions concerning educational programs. It is inappropriate for users of cost information to assume that the higher the cost of

a particular program, the higher its quality; or the lower the cost of a program, the greater its efficiency. The cost of a program cannot be assumed to be a measure of its quality or efficiency.

Faculty Time and Effort Reporting

There is a long-standing issue in determining costs in higher education, which involves the appropriate distribution of faculty time or effort to the instruction, research, and public service functions. This distribution is necessary to attribute compensation cost to those functions benefiting from faculty activities.

The first aspect of this issue involves the use of time or the use of effort information as the basis for making a cost distribution. Time involves the number of hours expended, while effort involves the intensity of activity. If the distribution of faculty compensation is based on time information, cost results probably will be different from what they would be if the distribution were based on effort information.

Another aspect in faculty time or effort reporting involves the question of common cost. This difficulty can best be illustrated by the example of a professor who has a sponsored research project and in the conduct of research also provides instructional assistance to a graduate student enrolled in one of his courses. The issue is one of distributing the professor's time or effort to determine the cost of instruction and the cost of research when they occur simultaneously. A possible resolution of this issue lies in reaching consensus on a procedure for an equitable assignment of faculty time or effort. Such a resolution may well be subjective however, and would require acceptance by a number of concerned groups, including those outside the institution who provide funds.

Costing Units

While it is possible to measure the inputs of higher education activities, there is no general agreement on the definition of measures of output for instruction, research, and public service. In the absence of acceptable output measures, many institutions have substituted measures of the process for costing units.

The definitions of costing units may vary within an institution and from institution to institution, which results in variations in unit cost information. For instance, within a university a general definition of the semester credit-hour may be established, but a particular school in the same university may decide to use a different credit-hour definition for its own purposes. Similarly, the definition of the student credit-hour can vary among institutions depending on whether they are counted at registration, after the drop/add period, or at the end of the semester. These costing unit difficulties will have to be resolved in order to report cost information in a uniform manner.

Formula Funding

Much attention has focused on the development of unit cost information as the basis of formula funding from government agencies. Many state legislatures and local government bodies are asking basic questions such as: How much funding is required for higher education and how should funds be allocated, recognizing that institutions provide different programs and services?

A number of states and local governments have attempted to resolve such questions by developing allocation formulas that involve numerous factors, including unit cost information. The equitableness of allocations resulting from these formulas depends on how well the formulas approximate the real funding needs of the institution, as well as the accuracy and validity of the data used in these formulas. It must be recognized that programs with similar titles may have significantly different costs because of differences in terms of purpose, scope, quality, and efficiency. Analysis of program differences, including cost and non-cost aspects, should be a factor in the development and use of a formula if the resulting distribution of funds is to be equitable.

Interinstitutional Comparisons and Analyses of Cost Information

Some institutional administrators and certain external agency representatives have suggested

that interinstitutional comparisons and analyses of cost information are useful for evaluating programs and related activities and for allocating resources both within and among institutions. In using cost in this manner, however, it is evident that there are differences among institutions of higher education that affect the validity of cost information for comparison purposes. These differences may be classified as methodological or functional. When performing a cost study for purposes of interinstitutional cost comparisons and analyses, it is necessary to attempt to eliminate methodological cost determination differences so that the resulting cost information highlights only functional differences.

Methodological differences result from costing procedures that are not uniformly applied. Typical examples of methodological differences are the following:

1. The judgments exercised in collecting, estimating, and allocating costs differ since they often depend on the interpretation of complex situations and on the unique characteristics of individual institutions. For instance, experience has indicated that there are no generally accepted bases suitable for all allocations of indirect cost.
2. The definition of direct and indirect cost can be different from institution to institution, depending on the ability of an institution to identify cost as direct.
3. The methods used to accumulate and analyze cost may differ from institution to institution.

Functional differences principally result from differences in programs and related support activities. Identifying the actual cause of such differences among institutions requires an analysis of the characteristics and content of programs being compared. The following are examples of functional differences affecting the comparison and analysis of cost information:

1. Missions, goals, and objectives differ among institutions.
2. Quality and efficiency of the educational process differ among institutions.
3. Organizational structure, activities, and units of service costed differ from institution to institution.
4. Constituents served by institutions have different needs and, therefore, require different education services.
5. Different geographical locations of institutions cause cost for similar items to vary.
6. Distinct differences exist between those institutions which are well established and those which are developing.
7. Economies of scale may be available to a larger institution and not to a smaller one.
8. Variations in costs occur because of differences in the availability of funds.

If methodological differences can be eliminated and true functional differences identified, the question remains as to how cost information should be used internally by management and externally by government agencies. Can adequate analysis of the relationship of differences in cost to functional differences be developed to permit valid and equitable decisions? Comparative analysis is less difficult when dealing with like institutions, but becomes progressively more difficult as comparisons are made among dissimilar institutions. Much study is required to prove the utility of interinstitutional cost information.

COSTING STANDARDS

The term "costing standards" as used here refers to principles that should be applied in determining cost. Costing standards constitute the framework or foundation on which costing is performed. Because costing standards are basic definitions of how costs should be determined, they provide a better understanding of the meaning and applications of costing.

Costing standards facilitate a more consistent determination of cost; however, the application of these standards will not insure uniform determination of cost information, because judgmental and other factors are involved in the costing process. Costing standards provide criteria for the selection of costing alternatives that are valid in terms of their justification of cost accumulation and allocation within a conceptual foundation of cost accounting theory.

The development of costing standards is an evolving process and additional standards may be added from time to time as more study is given to this complex subject.

Costing Standard #1

THE PURPOSES FOR WHICH COST INFORMATION IS TO BE USED SHOULD DETERMINE THE FRAMEWORK WITHIN WHICH COST INFORMATION IS DEVELOPED

Costs are determined to satisfy specific purposes for which cost information is needed. A clear definition of these purposes is needed in order to specify the cost determination approach to be used.

Costing Standard #2

COST INFORMATION SHOULD BE BASED ON THE ACCRUAL METHOD OF ACCOUNTING

Two methods of determining cost are the cash basis method and the accrual basis method. The cash basis method of accounting recognizes expenditures when cash is paid, whereas accrual accounting recognizes expenditures when materials are used and services are performed. To provide valid and consistent cost, the accrual method of accounting should be used, applying the concept of materiality.

Costing Standard #3

COST DATA SHOULD BE RECONCILABLE TO OFFICIAL FINANCIAL ACCOUNTING DATA

Reconciliation to official financial accounting records is necessary to insure the validity of cost records. (Reconciliation is the process of identifying and giving appropriate consideration to differences in two or more sets of data.)

Costing Standard #4

NONFINANCIAL DATA SHOULD BE RECONCILABLE TO OFFICIAL INSTITUTIONAL RECORDS

Reconciliation of nonfinancial data to the official records of the institution is necessary to insure the validity of cost data when such nonfinancial data are used in the cost determination process. (Reconciliation is the process of identifying and giving appropriate consideration to differences in two or more sets of data.)

Costing Standard #5

DEFINITIONS USED IN COST DETERMINATIONS SHOULD BE APPLIED UNIFORMLY

Uniform definitions should be employed during the cost determination process and from period to period to achieve reliable cost information.

Costing Standard #6

COST INFORMATION AND RELATED COSTING UNITS SHOULD COVER THE SAME PERIOD

Cost determination for a particular period should be related to the units of service provided during that same period.

Costing Standard #7

COST INFORMATION SHOULD BE CONSISTENTLY DETERMINED

Cost information used in any cost study must be consistently determined for all periods included and for all organizational units included. Cost data will not be comparable unless consistently determined. Consistency depends on uniform definitions, methods, and interpretations as well as judgments exercised in the cost determination process.

Costing Standard #8

COST SHOULD BE ATTRIBUTED TO A COST OBJECTIVE BASED ON A CAUSAL OR BENEFICIAL RELATIONSHIP

Meaningful and dependable cost determinations require that costs be assigned to cost objectives according to identifiable relationships that logically and reasonably cause the cost to occur or that result in benefits received by the cost objective.

Costing Standard #9

INDIRECT COST SHOULD BE ALLOCATED BASED ON QUANTITATIVE MEASURES THAT CAN BE APPLIED IN A PRACTICAL MANNER

The bases of allocation of indirect cost should involve the use of those quantitative measures which best represent the relationship of cost to the cost objective, with the result that indirect costs are equitably distributed. There are instances when the most equitable distribution may not be the most practical, both in terms of time and related expense involved in collecting and tabulating quantitative measures. In such cases, the most practical measure should be selected, provided the results are not materially different.

Costing Standard# 10

COMMON COST INCURRED TO PROVIDE TWO OR MORE SERVICES SHOULD BE ALLOCATED IN AN EQUITABLE MANNER

Allocation of common costs to joint services, which are cost objectives, should be based on a logical relationship of the several services to one another and to the nature and circumstances of the costs incurred. It should be recognized that separate costing of jointly produced services is subjective and the bases available to allocate joint costs are arbitrary.

Costing Standard #11

CAPITAL COST OF A COST OBJECTIVE SHOULD REFLECT THE APPLICABLE EXPIRED CAPITAL COST OF THE PERIOD

Capital cost of a cost objective should reflect applicable expired cost determined on the basis of the estimated useful life of the asset being depreciated.

Costing Standard #12

COST INFORMATION SHOULD BE ACCOMPANIED BY A DISCLOSURE STATEMENT

Explanatory disclosures necessary to provide the user with a clear understanding of the previously established, intended use of cost information should accompany the reporting of such information. Disclosures should encompass the costing method and approach used, the cost definition used, the types of cost included, identification of cost objectives and costing units, and other information pertinent to the cost determination effort.

APPENDIX C

Student Data Module Software Description

Student Data Module
Software Description

The Student Data Module (SDM) is a computer-based software package that is used to construct an Instructional Work Load Matrix. The package is part of a complete software system called the NCHEMS Costing and Data Management System that is useful as an aid in cost analysis. The system will operate on any medium-sized computer (including mini-computers) that has ANS (American National Standard) COBOL and internal (core) memory equivalent to 50,000 bytes on an IBM machine.

The software package is known as generalized software, meaning it will run on most sizes and types of colleges including public, private, two-year, four-year, or university. The campus using this software defines the departments, majors, student levels, and course levels used in a cost study through a series of external tables. As any of these definitions change, data entries are changed in the external tables.

The Student Data Module is a stand-alone part of the software system. That is, the module can be used independently of other parts of the system. It will interface with other modules in the system including the Center's simulation model, the Resource Requirements Prediction Model (RRPM).

To use the Student Data Module, a campus needs a computer large enough to execute the programs and a set of data in machine-readable form describing student registrations. For each course that a student takes

during the time period of the cost study, a record must be formatted with the following data elements:

- Student identifier (this field is used only for head-count statistics)
- Term (fall, spring)
- Department or discipline teaching the course
- Course level for the course (if ranges of course numbers represent the course level, the course number may be included)
- Major of students when they took the courses
- Student level of the student when the course was taken
- Credit hours the student received for the course

A data record similar to that described above must be generated for all students and include each course taken during the period of the analysis. The SDM software processes these data to produce the IWLM.

Further information on the NCHEMS Costing and Data Management System can be obtained from the Center through the following address:

NCHEMS Software Distribution
National Center for Higher Education Management Systems
P.O. Drawer P
Boulder, Colorado 80302

The Costing and Data Management System software was developed with funding provided by the National Institute of Education. The current price is $200.00 for the computer source code and system documentation.

APPENDIX D

Constructing an Instructional Work Load Matrix

Constructing an Instructional Work Load Matrix

Creating an Instructional Work Load Matrix (IWLM) requires a tabulation of the course work taken by each student enrolled. The tabulation is usually done with assistance from a computer system because of the large volume of data necessary to document the course work for all students. Colleges and universities generally use one of two means to develop an IWLM for their campus: (1) the NCHEMS Costing and Data Management System software package, which provides an inexpensive means if a medium-sized computer facility is available and (2) development of their own software to perform the necessary tabulations and report the results.

The student-registration data shown in table 1 represent the key data elements necessary for construction of an IWLM. For each course taken by each student, the course abbreviation and number are used to determine the IWLM matrix row or discipline and course level. Sue Kay, for example, is taking Biology 104. Using the course-numbering convention shown, courses in the range of 0 to 299 are undergraduate. The discipline in the matrix shown in figure A corresponding to this biology course is "UG Biology," representing undergraduate courses in biology. She is enrolled as an undergraduate biochemistry major. Column (B) in figure A corresponds to her major and student level. The semester credits associated with the course are tabulated in the IWLM cell corresponding to the biology undergraduate discipline ((A)) and the biochemistry undergraduate majors ((B)).

TABLE 1

SELECTED STUDENT-REGISTRATION RECORDS

Student ID	Student Name	Course Number	Major	Student Level	Semester Credits	IWLM Discipline	IWLM Program
723-31-8133	Sue Kay	BIO 104	Biochem	UG	3	UG Biology	Biochem UG
720-33-8122	Robert Allen	BIO 112	Psychology	UG	3	UG Biology	Psych. UG
649-29-7111	Mary Smith	ENG 210	English	GR	3	UG English	English GR
743-31-7981	Arnold Black	MATH 256	English	GR	3	UG Math	English GR
711-34-6122	Michael Lee	CHEM 400	Biochem	UG	5	GR Chem	Biochem UG
731-36-8644	Robert Trent	BIO 104	Psychology	UG	3	UG Biology	Psych. UG

NOTE: Undergraduate courses carry numbers from 0 through 299.
Graduate courses carry numbers from 300 through 499.

The matrix in figure A shows the results of accumulating all the course information in table 1. Note that the sum of student credit hours taken in the biology undergraduate discipline by psychology undergraduate students was six credit hours. This further illustrates that the IWLM is an accumulation of all the student credit hours taken by students.

Any computer system employed to generate in IWLM using the logic outlined above should allow for data from one or more time periods (for example, semesters). It should also provide head count and FTE enrollment statistics that can be compared with institutional records to reconcile the results.

FIGURE A

INSTRUCTIONAL WORK LOAD MATRIX

		(B) MAJORS					
		Biochemist. Undergrad.	Biochemist. Graduate	English Undergrad.	English Graduate	Psychology Undergrad.	Psychology Graduate
(A) DISCIPLINES	UG Biology	3				6	
	GR Biology						
	UG English				3		
	GR English						
	UG Math				3		
	GR Math						
	UG Chemistry						
	GR Chemistry	5					

Bibliography

Adams, Carl R.; Hankins, Russell L.; and Schroeder, Roger G. *The Literature of Cost and Cost Analysis in Higher Education.* Study of Cost Analysis in Higher Education, Monograph 1. Washington, D.C.: American Council on Education [ACE], 1978.

Adams, Carl R.; Kingston, Gordon W.; and Schroeder, Roger G. *The Future Use of Cost Analysis in Higher Education.* Study of Cost Analysis in Higher Education, Monograph 4. Washington, D.C.: ACE, 1978.

Adams, Carl R.; Hankins, Russell L.; Kingston, Gordon W.; and Schroeder, Roger G. *The Production and Use of Cost Analysis in Institutions of Higher Education.* Study of Cost Analysis in Higher Education, Monograph 2. Washington, D.C.: ACE, 1978.

Bacchetti, Raymond F. "Using Cost Analysis in Internal Management in Higher Education." *NACUBO Professional File* 9 (January 1977): 1-10.

Beatty, George. "The Application of Costing Methodologies in Higher Education." In *Applying Analytic Methods to Planning and Management,* pp. 87-97. New Directions for Institutional Research, no. 13. Edited by David P. Hopkins and Roger G. Schroeder. San Francisco: Jossey-Bass, 1977.

Byers, Maureen, and Bower, Cathleen. *IEP Analysis and Use: Single-Institution Data.* NCHEMS Technical Report 73. Boulder, Colo.: National Center for Higher Education Management Systems [NCHEMS] at Western Interstate Commission for Higher Education [WICHE], 1975.

"Colleges and Money: A Faculty Guide to Academic Economics." *CHANGE*, (1976), pp. 3-32.

Collard, William J.; Farmer, James; and Harrison, John G. "The Systems Approach to Educational Management." In *Facing Financial Exigency*, pp. 33-47. Edited by Frank R. Kemerer and Ronald P. Satyrb. Lexington, Mass.: Lexington Books, 1977.

Gamso, Gary S., and Service, Allan L. *Introduction to Information Exchange Procedures: A Guide for the Project Manager.* NCHEMS Technical Report 76. Boulder, Colo.: NCHEMS at WICHE, 1976.

Haight, Michael J. *An Introduction to the NCHEMS Costing and Data Management System.* NCHEMS Technical Report 55. Boulder, Colo.: NCHEMS at WICHE, 1975a.

Haight, Mike, and Martin, Ron. *NCHEMS Costing and Data Management System Student Data Module Reference Manual.* NCHEMS Technical Report 60. Boulder, Colo.: NCHEMS at WICHE, 1975b.

Hopkins, David S.P., and Schroeder, Roger G., eds. *Applying Analytic Methods to Planning and Management,* editor's notes, pp. vii-xii. New Directions for Institutional Research, no. 13. San Francisco: Jossey-Bass, 1977.

Huff, Robert A., and Young, Michael E. *Profiles of Management Information Uses.* Boulder, Colo.: NCHEMS at WICHE, 1974.

Hughes, Scott K., and Topping, James R. *Procedures for Determining Historical Full Costs.* 2nd ed. NCHEMS Technical Report 65. Boulder, Colo.: NCHEMS; Washington, D.C.: National Association of College and University Business officers [NACUBO], 1977.

Leslie, David W. "Financial Exigency and the Future of the Academy." In *Facing Financial Exigency*, pp. 3-15. Edited by Frank R. Kemerer and Ronald P. Satyrb. Lexington, Mass.: Lexington Books, 1977.

Myers, Edward M., and Topping, James R. *Information Exchange Procedures: Activity Structure.* NCHEMS Technical Report 63. Boulder, Colo.: NCHEMS at WICHE, 1974.

National Association of College and University Business Officers [NACUBO]. *College and University Business Administration.* Washington, D.C.: NACUBO, 1975.

Robinson, Daniel D.; Ray, Howard W.; and Turk, Frederick J. "Cost Behavior Analysis for Planning in Higher education." *NACUBO Professional File* 9 (May 1977): 1-49.

Romney, Leonard C. *Faculty Activity Analysis: Overview and Major Issues.* NCHEMS Technical Report 24. Boulder, Colo.: NCHEMS at WICHE, 1971.

Schroeder, Roger G., ed. *Site Visit Descriptions of Costing Systems and Their Use in Higher Education.* Study of Cost Analysis in Higher Education, Monograph 3. Washington, D.C.: ACE, 1978.

Sheehan, Bernard S., and Gulko, Warren W. "The Fundamental Cost Model." In *Assessing Computer-Based Systems Models,* pp. 53-58. New Directions for Institutional Research, no. 9. San Francisco: Jossey-Bass, 1976.

Shoemaker, William A., ed. *Instructional Program Analysis: A Users Manual.* Washington, D.C.: CASC Planning and Data Systems, 1978.

Topping, James R., and Miyataki, Glenn K. *Program Measures.* NCHEMS Technical Report 35. Boulder, Colo.: WICHE, 1973.